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ANCIENT INDIA

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NOTES

(Plates I–III)

1. This is the first issue of a new serial publication of the Archaeological Survey of India. It is partly the outcome of war-conditions, which stopped the printing of annual reports and monographs on the old lavish scale. But it is also an experiment in a new and, I think, timely form of publicity of a kind which has not previously been tried in India. It is an attempt to put archaeology regularly on to the bookstalls, and to interest the educated Indian public in current work relating to the exploration and conservation of their great heritage of material culture. Under post-war conditions it is hoped that illustrations will bulk almost as largely as text in these pages. Meanwhile, if text is unduly preponderant, the war and its aftermath may be held accountable.

2. The individual contributions to this periodical will fall mainly into two categories. ne category will comprise articles of 'general interest' in so far as that vague phrase is efinable; the other category will include a proportion of technical matter of interest rimarily to the professed archaeologist. Every effort will be made to maintain a fair balance etween the two interests.

3. The material available in India for a publication of this kind is almost infinite. The present issue contains papers dealing with the earliest known Indian culture to which the term 'civilization' can be applied—the Indus valley culture of the third millennium B.C.; with relics of the protohistoric period when Persians and Greeks were successively penetrating the frontiers of Hindustān; with the medieval phase of Muslim conquest and the building of Tughlaq's Delhi; inevitably with the Tāj Mahal, without some reference to which no new archaeological venture in India could auspiciously begin; and with a contribution to the second category, in the form of a summary account of a pottery-sequence extending from the third century B.C. to the eleventh century A.D. This last is not designed for casual reading but is an important addition to a study of what has been described as the Alphabet of Archaeology, a study which has hitherto received less than its due in India. The next issue is expected to include articles on the Stone Age of India, on an important Romano-Indian site in South India, on the Mauryan and pre-Mauryan city of Taxila (Punjab), and on megalithic survivals in modern India. It is also proposed in future issues to summarize current archaeological work systematically both in British India and in the Indian States.

4. The article on Taxila will deal with exploratory work carried out by the Archaeological Survey on that famous site in 1944-5. This work was supplementary to the long series of excavations initiated there by Sir John Marshall as Director General of Archaeology and was designed to throw light on certain outstanding problems, notably the unknown cultures of north-western India in the centuries immediately preceding the dawn of history

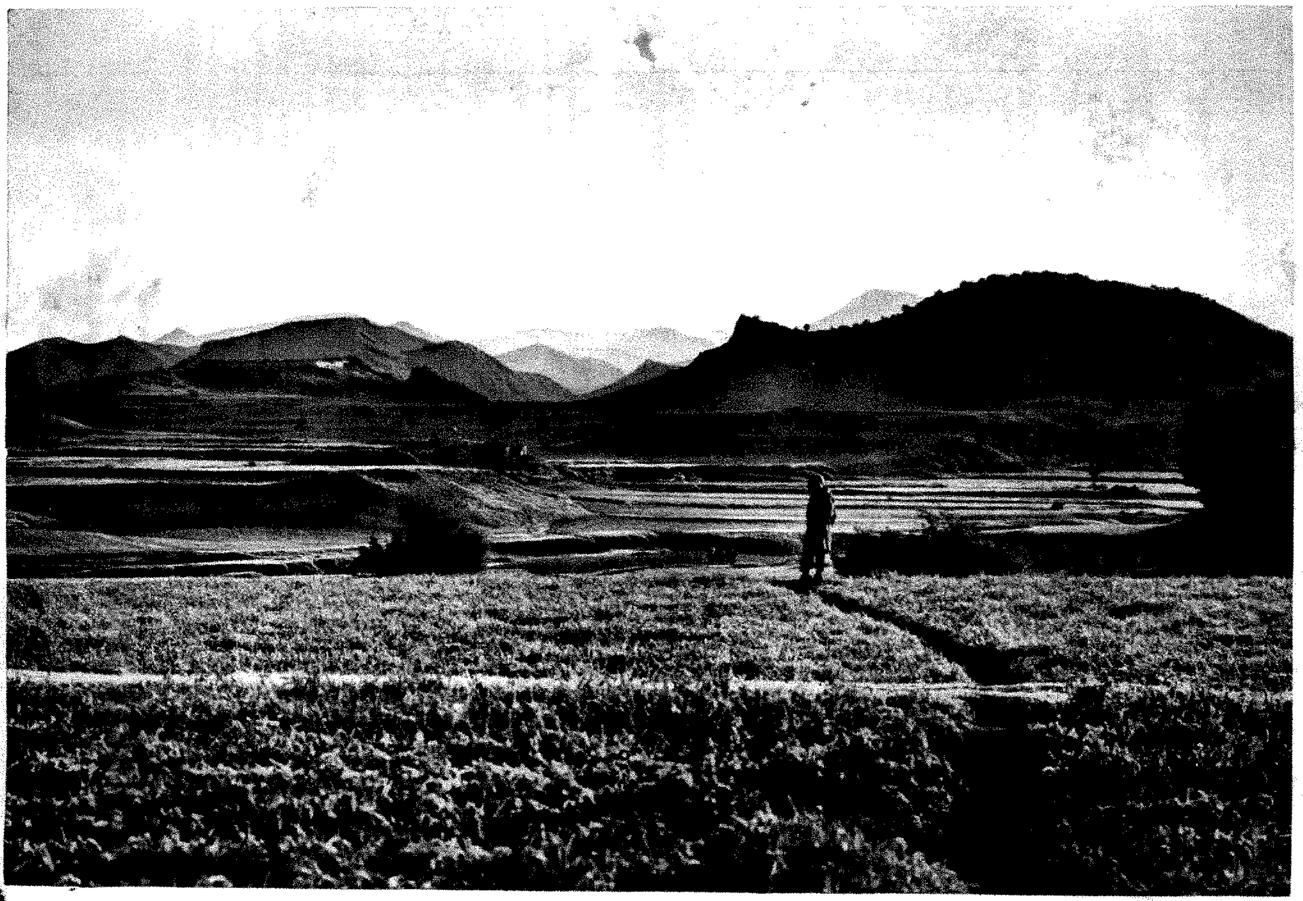
Its main purpose, however, was to form a basis for the technical training of Indian student at a centre of known and varied interest, where suitable equipment in the form of an organized museum and workshops was available. These were supplemented by a colony o tents, a lecture-room and a chemical laboratory. The students themselves, sixty-one i number, represented all parts of India and all creeds, and worked together with a harmon which was itself an instructive lesson in the unifying influence of the pursuit of knowledge Most of them were research students from the Indian universities; others were in archaeological employment in Indian States, others again were delegates from provincial or municipal museums. Their course of training lasted for a minimum period of two months, bu many stayed longer.

5. The day's work at the school began at 8.45 a.m. The students were divide into three classes, each student passing after a stipulated period from one class to another The largest class consisted of trainees in the actual technique of excavation or the supervision of excavation, and in the preparation of the necessary field-records. The othe classes dealt with surveying, photography and administration. At 6 p.m. field-work ceased but at 9 p.m. the students reassembled for a lecture on subjects such as publication, epigraphy photography, or special historical, archaeological and anthropological topics. Thes lectures were given by the staff, by visitors, or sometimes by the students themselves. Th day ended at about 10.30 p.m.

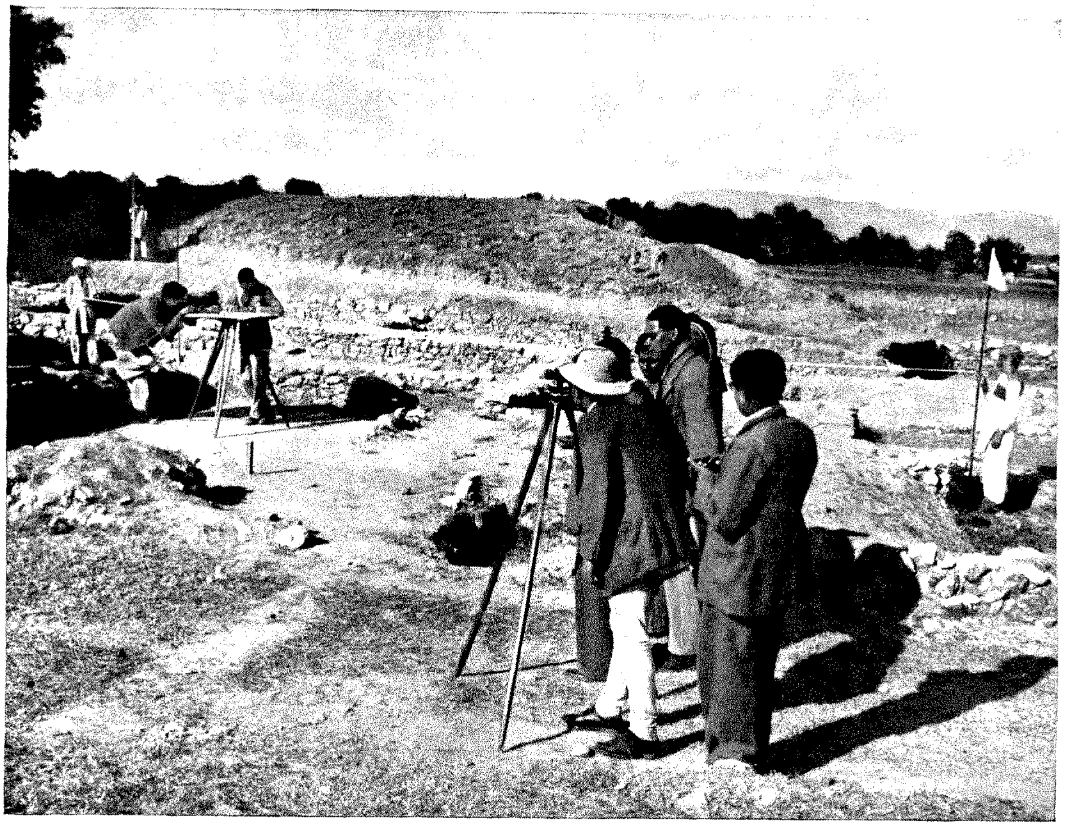
6. Strenuous though the day's work was, the course was necessarily too short to giv the students more than a general knowledge of the standards aimed at by modern archaeological technique. It could not profess to turn out fully qualified field-archaeologists, fo whom long-term experience is indispensable. It could not produce skilled recorders o photographers capable of embarking on single-handed work. But it could and did attemp to demonstrate the special requirements of archaeological field-recording and photograph and thus provided the basis essential for further advance. The nature of that furth advance will be discussed on a future occasion. Meanwhile, it will suffice to remark th a condition for the advancement of the study of India's great heritage is the widesprea extension of archaeological research from the confines of a Government Department int the liberal activities of the universities and learned societies of India; from the monopol of the civil servant to the free initiative of the educated public. Only then will it be possibl for Indian archaeology, with its unsurpassed opportunities, to take a proper place amids the free sciences of the world.

7. Until this process of devolution is far advanced, the responsibility resting upon th Archaeological Survey of India will continue to increase disproportionately with the increasing complexity of the science which it represents. In spite of war-conditions, certai steps have accordingly been taken recently by Government to equip the Department a littl more adequately for its function. Thus, the Excavations Branch, abolished in the genera retrenchment of 1932, has been re-established as a specialized nucleus for Indian field-archaeology. The systematic survey of prehistoric sites, such as megaliths, urn-fields, and implement-bearing strata of the Stone Age, will now for the first time be organized by a prehistorian appointed for the purpose. The Epigraphical Branch has been reshaped, an includes the essential addition of a Muslim Epigraphist. The task of conservation will now become the full responsibility of the Survey, instead of being, as hitherto, delegated in par to a fluctuating personnel provided by the Public Works Departments. And two research-scholarships have been reconstituted in connection with the Department on an annual basis. In these and in other ways a better balance has been achieved between the Department's personnel and its various activities. The reforms are admittedly inadequate in detail and will require amplification in the light of further experience; but they at least imply a new recognition of the scope of the Archaeological Survey and, coupled with

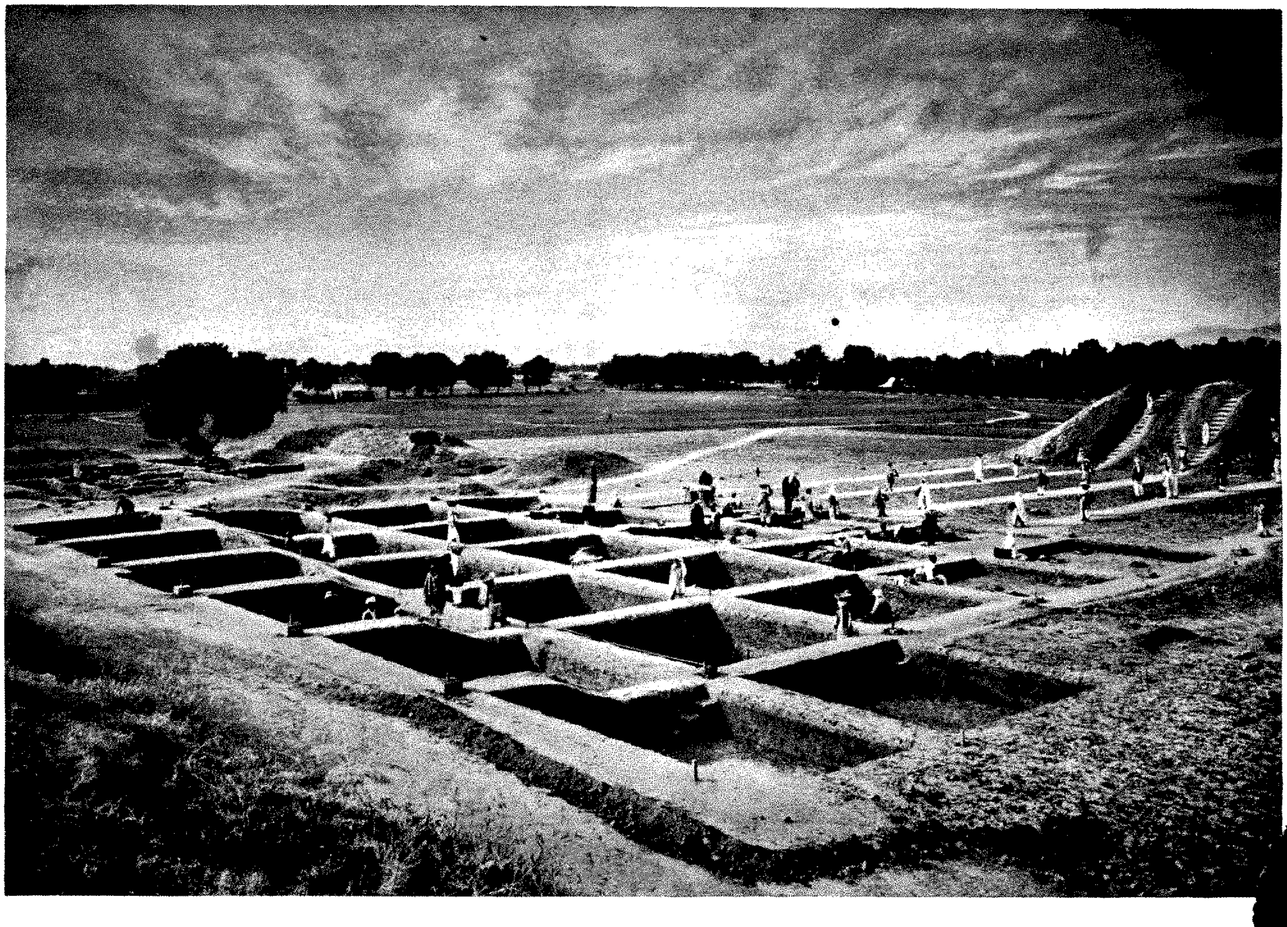
A. *Students of the archaeological training school at Taxila* (*Punjab*), 1944-5.



The view from the school at sunrise: the hill in the middle distance, right, was the acropolis of Sirkap, the second city of Taxila (*first centuries B.C.–A.D.*). *The foreground is the Bhir Mound, the first city of Taxila.*



A. *The Taxila training school: the survey class.*



B. *The Taxila training school: the excavation on the Bhir Mound, the site of the first city of Taxila (fifth to seco centuries B.C.)*

suitably high standard of training, may be expected to render the Survey better capable of grappling with its colossal task. For the adequate fulfilment of that task, the co-operation of the public is as necessary as the co-operation of an overburdened Government and a few professional specialists. As an intermediary, the All-India Advisory Board of Archaeology recently constituted by the Central Government can do much to broaden the base of archaeological studies in India. It represents the States, the universities and other interested bodies and individuals, and its wise partnership can be opportune and effective.

8. *Ancient India* makes its first appearance in a wartime garb which is necessarily imposed rather than chosen. When paper-supply and other services approach more nearly to normality, it will appear twice yearly, on the first of January and the first of July. Meanwhile it will do its best.

R. E. M. W.

REPAIRS TO THE TĀJ MAḤAL

By M. S. Vats

(Plate IV)

Most wartime visitors to the Tāj Maḥal found its dome obscured by scaffolding. The Superintendent in charge of the Northern Circle of the Archaeological Survey of India at Agra here gives the reason.

THE Tāj, which deservedly ranks amongst the finest tombs of the world, stands on the right bank of the Jumna, about a mile below Agra Fort, and contains the remains of the Emperor S͟hāh Jahān (1627–58) and of his favourite wife, Arjumand Bānū Begam, better known as Mumtāzu-z-Zamānī or Mumtāz Maḥal. She was the daughter of Abu-l-Ḥasan, entitled Āṣaf K͟hān Āṣaf Jāhī, son of I'timādu-d-Daula Mīrzā G͟hayāt͟h, and niece of the illustrious Nūr Jahān, wife of the Emperor Jahāngīr (1605–27). In her twentieth year she was married to Prince K͟hurram, afterwards the Emperor S͟hāh Jahān, on Friday the 9th of Rabī' I, 1021 A.H. (10th May, 1612 A.D.) and died on the 7th Zīqa'da, 1040 A.H. (28th June, 1631 A.D.) after giving birth to her fourteenth child, Princess Gauharārā, at Burhānpūr in K͟hāndes whither she had accompanied her husband on his expedition against K͟hān Jahān Lodī, the rebellious Governor of the Deccan. Her body was temporarily interred in the garden of Zaināābād at Burhānpūr, whence, under the orders of S͟hāh Jahān, it was brought to Agra after six months on the 17th Jamādī I, 1041 A.H. (11th December, 1631 A.D.) by Prince S͟hajā', Wazīr K͟hān and Satīu-n-Nisā K͟hānam, sister of the poet-laureate, Mīrzā Ṭālib Āmlī.

In the meantime a suitable site was selected which, being the garden of Rāja Jai Singh of Jaipur, was duly exchanged for equally valuable State land, and her remains were again temporarily deposited near the present *Bāolī* in a domed structure on the 15th Jamādī II, 1041 A.H. (8th January, 1632 A.D.) until their permanent burial in the mortuary chamber of the Tāj. The Emperor himself died on Monday the 26th of Rajab, 1076 A.H. (1st February, 1666 A.D.) and was buried in the same chamber to the west of Mumtāz Maḥal's grave.

The question as to who designed the Tāj is disputed, but there is epigraphical evidence to show that is was Ustā Aḥmad of Lahore[1]. The mausoleum was constructed under the superintendence of Makramat K͟hān and Mīr 'Abdu-l-Karīm, the dome being built by Ismā'īl K͟hān of Turkey and the inscriptions executed by 'Abdu-l-Ḥaq, better known as Amānat

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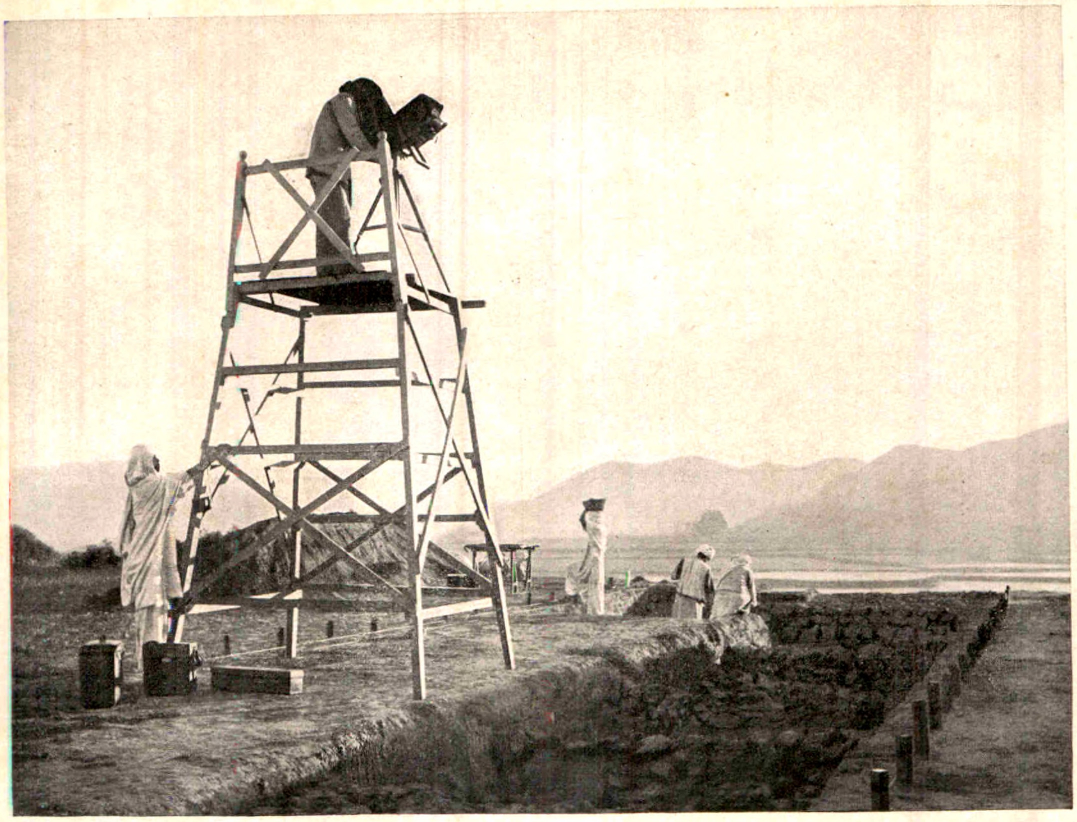
[1] The *Mat͟hnawī* of Lutfullāh Muhandis, second son of Ustā Aḥmad of Lahore, which, according to a chronogram in it, was completed in the year 1066 A.H. (1655-56 A.D., i.e. during the reign of S͟hāh Jahān) pointedly states that Ustā Aḥmad was responsible for the construction of the Tāj, the Delhi Fort and the Jāmi' Masjid at Delhi, besides other imperial buildings.

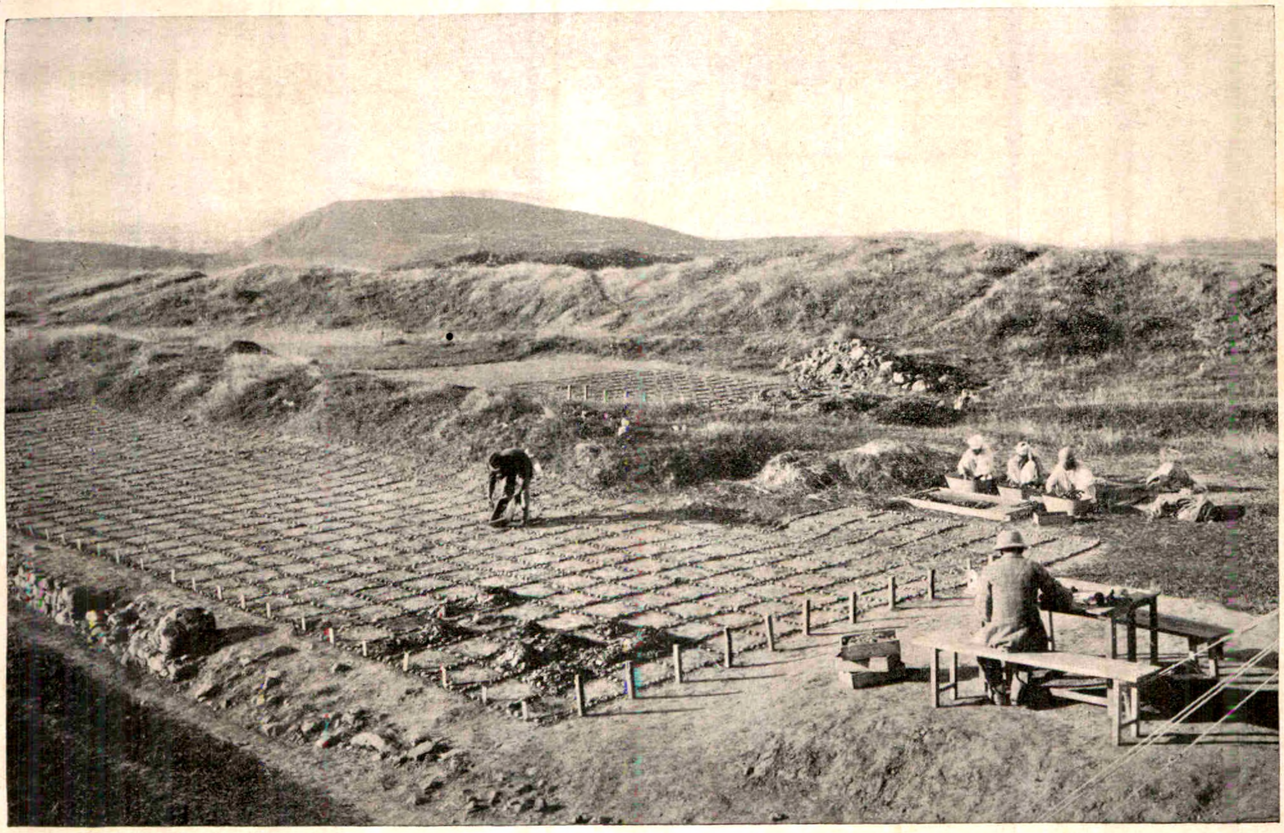
Ustā Aḥmad's eldest son, 'Atāullāh Ras͟hīdī, in his work entitled *K͟hulāṣatu-l-Ḥisāb*, also written during the reign of S͟hāh Jahān, mentions his father as *Mi'mār-i-Kul* (Chief Architect) of S͟hāh Jahān.

His third son, Nūrullāh, was responsible for the inscriptions in the Jāmi' Masjid at Delhi. These facts indicate that Ustā Aḥmad and all his sons had been working at the royal buildings.

Again, Luṭfullāh, in the epigraph engraved by him on his father's tombstone at Aurangābād, confirms that Ustā Aḥmad was the builder of the Tāj, Delhi Fort and the Jāmi' Masjid at Delhi. The cumulative effect of the above evidence is that Ustā Aḥmad of Lahore was probably the designer of the Tāj as shown above; *vide* also the Annual Number of the *Kārwān* for 1934 (Lahore) compiled by Majīd Malik, pp. 125–34.



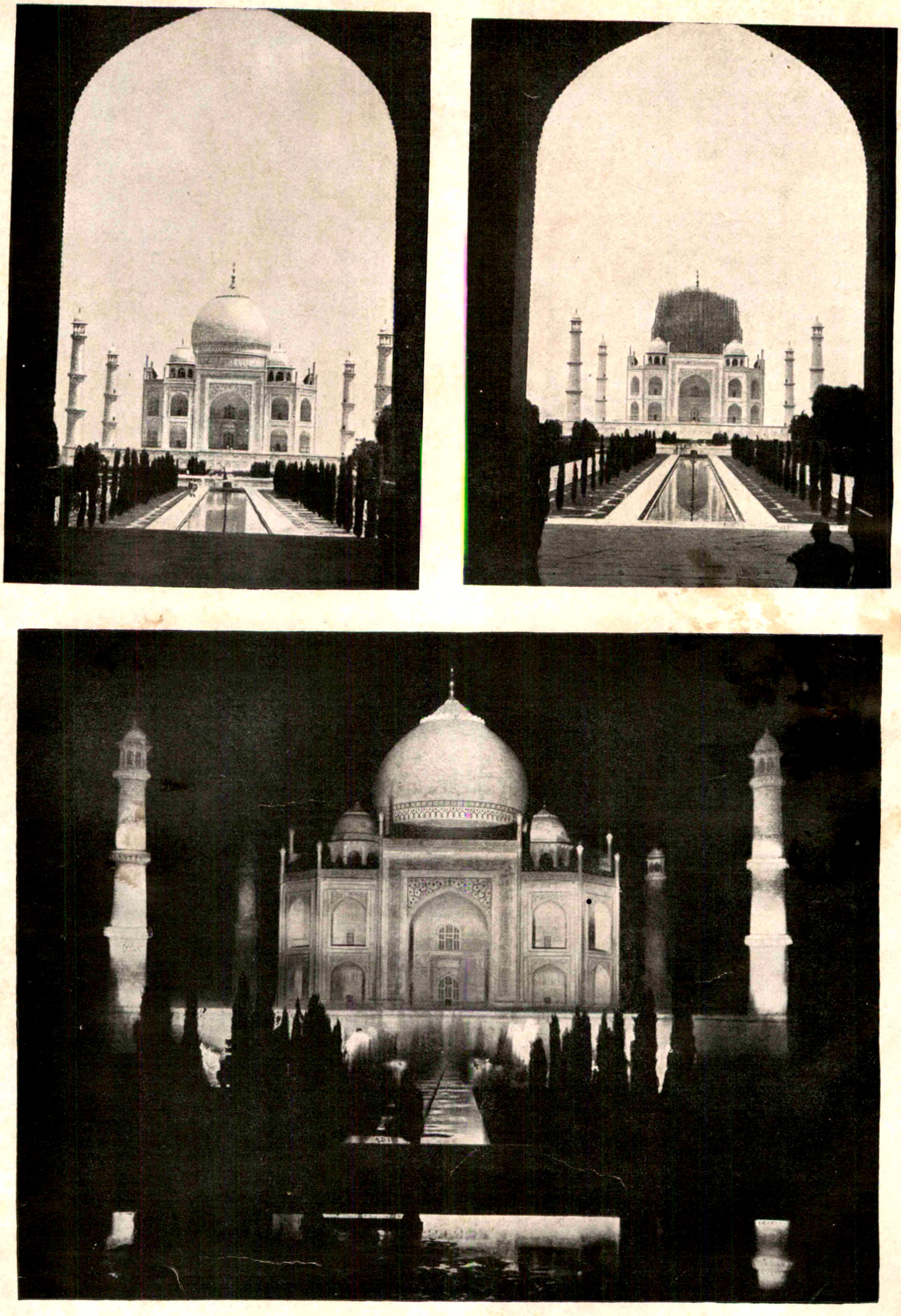
A. *The Taxila training school: photography at Sirkap.*



. *The Taxila training school: squares, labelled with the horizontal and vertical locations of strata, for the purpose of sorting pottery as it is brought in from the excavation. In the right foreground the pottery is being marked and registered; in the background it is being washed.*

PLATE IV

To face page 5



The Tāj Maḥal, Agra. Top right, *recent view of scaffolding.*
Below, *flood-lighting by U.S.A. troops on 'VE' Day*, 1945.

Khān of Shīrāz, who was brother of Shāh Jahān's minister, Afẓal Khān, and was the best caligraphist of his age. The tomb was begun in 1041 A.H. (1631 A.D.) and completed in 1057 A.H. (1648 A.D.) with the mosque on the west, the *Jawāb* or *Mihmānkhāna* on the east and the main gateway on the south, the outer court and its cloisters being added subsequently and completed in 1653. The white marble so plentifully used came from Makrāna and Rāiwāla in Jaipur State, the red sandstone from Fatehpur Sikri and the neighbourhood of Agra, and the jewels and precious stones from Persia and elsewhere. Mullā 'Abdu-l-Ḥamīd Lāhorī, who was instructed by Shāh Jahān to write a detailed history of the Tāj, further informs us in the *Bādshāhnāma* that the foundation was laid on the sub-soil water-level, that the masonry below the ground is stone in lime, and that the platform above ground is of brick in mortar faced with marble veneer. Owing to the proximity of the river the whole fabric together with the four corner *mīnārs* has been made to rest on a firm bed of masonry which seems to have been supported on piers sunk at close intervals in accordance with the usual Mughal practice. The exact cost of the Tāj with its complementary buildings is not known. The recorded expenditure of 50 lakhs of rupees is rightly construed to mean that the above amount was expended on miscellaneous petty charges and the wages of 20,000 workmen, etc., who worked at the Tāj for so many years, but not on the acquisition of marble and semi-precious stones used for inlay.

The history of its repairs is no less interesting. The earliest record of its repairs is available in a letter,[1] dated 1652 A.D., from Prince Aurangzeb to his imperial father, Shāh Jahān, wherein he points out defects in the dome and vaults of the mausoleum, saying, 'the dome of the holy tomb leaked in two places towards the north during the rainy season and so also the fair semi-domed arches, many of the galleries on the second storey, the four smaller domes, the four northern compartments and the seven arched underground chambers, which have developed cracks. During the rains last year the terrace over the main dome also leaked in two or three places. It has been repaired, but it remains to be seen during the ensuing rainy season how far the operations have proved successful. The domes of the mosque and the Jamā'at Khāna leaked during the rains and were made watertight. The master builders are of the opinion that if the roof of the second storey is re-opened and dismantled and treated afresh with concrete over which half a yard[2] of mortar grout is laid, the semi-domed arches, the galleries and the smaller domes will probably become watertight, but they say that they are unable to suggest any measures of repairs to the main dome . . . .' History is, however, silent about the actual steps taken by the Emperor on the Prince's letter in respect of repairs to the dome.

From subsequent records it is gathered that under the British rule Captain Taylor was appointed in 1810 to execute repairs to the Tāj with the guidance of Col. Hyde, the then acting Chief Engineer, and the entire outer surface of the Tāj was repaired and cleaned, the missing stones replaced, and the mosaic-work completely renewed. But Captain Taylor's use of coloured *chunam* in place of the inlaid stones of the original decoration proved a failure, as the ornamental work done by him was badly damaged during the heavy rains. After a long gap of over half a century, further steps were taken in 1864 when Dr. Murray replaced a number of flowers and broken marble slabs in the octagonal tomb chamber. In 1874 Mr. Alexander, Executive Engineer, Agra, carried out more extensive repairs amounting to Rs.70,926. The principal items of his work were the removal of the broken marble, the substitution of new pieces in the vaulted opening, the restoration of some of the inlaid work, the regilding of the finial surmounting the main dome, the rendering of the main dome with Portland cement and the resetting of the pinnacles of the gateway which had fallen down.

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[1] The original letter is published in the *Muraqqa'-i-Akbarābād*, ed. by Sa'īd Aḥmad (Agra, 1931), p. 43, footnote 2.

[2] Abu-l-Faẓl, in his *Āīn-i-Akbarī* (Royal Asiatic Society of Bengal, 1872, II, Bk. iii, pp. 294–6), mentions the names of various 'yards' used in the reigns of Sikandar Shāh Lodī, Humāyūn and Akbar and gives their exact lengths, which ranged from 41 to 46 fingers. According to the *Bādshāhnāma* (Roy. As. Soc. Bengal, 1867, Persian text, I, part ii, p. 237), the *Zara'* (or yard) of Shāh Jahān measured 40 fingers or digits, one digit being equal to ¾″; *vide* also Webster's *English Dictionary*, p. 623. Thus Shāh Jahān's *Zara'* was equal to 2 ft. 6 in.

Although, as noticed above, superficial defects in stones, etc., were remedied from time to time, no serious attention was paid to the investigation of factors affecting the stability of the structure as a whole. In 1936, however, the Archaeological Survey of India became apprehensive of its deteriorating condition and proposed that the roofs of the second floor should be repaired, that the joints should be filled up with suitable cementing material, and that the fractured marble slabs of the main dome should be either renewed or reset. The estimated cost of these repairs, amounting to Rs.52,944, was duly sanctioned. But in view of the outstanding national importance of the Tāj the Government of India considered it expedient that before implementing any far-reaching measures for its conservation they should be fortified by the recommendations of a Committee of experts. Consequently in January, 1941, an Advisory Committee of five experts was appointed to investigate the causes of deterioration and to suggest adequate measures of repairs. The Committee was expanded in 1942 to include another five experts, and it will not be devoid of interest to give below extracts from the recommendations of the enlarged Committee:—

(*a*) Rain-water should be prevented from entering the masonry of the dome and the drum. To make the dome watertight, it is necessary that all the stones that have bulged out or cracked be reset or replaced in 'hydraulic lime mortar' with stones to the full height and thickness of a course. Patchwork should be avoided. The joints should be carefully filled with special lime mortar. This process should be repeated whenever necessary.

(*b*) Cracks in brick masonry should be filled with hydraulic lime mortar. A record should, however, be kept of any reappearance of these cracks in the future. At places where disintegration of mortar inside the vault is suspected, cement mixture should be injected under gravity feed.

(*c*) All exposed clamps and dowels should be removed and replaced by gun-metal clamps and dowels embedded thoroughly in cement grout.

(*d*) The joints of the outer facing of marble should be filled with special lime mortar to make the surface waterproof. The pointing of these joints should be done by raking them out to a depth of at least one inch and, if practicable, to three inches and filling them properly with special lime mortar.

(*e*) The inside surface of the dome should be stripped of plaster and left as such for a couple of years to observe the results of the above treatment of the dome and the drum, and if no defects develop then it should be replastered with hydraulic lime.

(*f*) The decayed concrete on the top of the inner dome should be removed and replaced with fresh cement concrete.

(*g*) The cracks in the masonry between the soffit of the vaults and the roof of the second floor should also be filled in with hydraulic lime mortar.

(*h*) The four *chhatrīs* or pavilions on the roof of the main building need not be dismantled. The domes of these *chhatrīs* are in a sound condition. The columns supporting the domes have deteriorated and should be rebuilt. The columns can be rebuilt by cribbing the dome and re-erecting the columns in three pieces in marble, namely, the base, the shaft and the capital.

(*i*) With regard to the *mīnārs*, the loose stones should be reset in hydraulic lime mortar and the damaged ones renewed. The entire surface should be pointed with special lime mortar and made waterproof.

(j) The entire exposed roof of the main building should be made waterproof by covering it with a suitable waterproofing material. Bituminous preparations should be avoided.

(k) With regard to the inside ventilation of the dome, the Committee urges that the advice of a chemist may be obtained in this respect and that the introduction of a mechanical ventilation device should be held over for the time being.

(l) The Committee considered that 104 Bench Marks on the building should be checked every ten years or after every earthquake and subsidence, if any, and should be carefully watched. Similarly, the verticality of the *mīnārs* should also be checked every ten years.

(m) A permanent record should also be maintained of all substantial repairs whenever such repairs are carried out.

(n) During the present repairs, it was found that, on raking out the joints of stones in the lower region of the outer surface of the drum, accumulated water oozed out in an appreciable quantity in three places in the south-east part of the dome. Seven gallons of water were found to have accumulated at one of these spots. For further precaution it is suggested that a few more stones, wherever there are signs of dampness in a layer, should be removed and replaced after ejecting the water thoroughly.

(o) The brickwork behind the marble veneering of the dome and the drum should be grouted by means of gravity feed. Holes, 1½-2 inches in diameter, should be bored in the marble facing wherever there are indications of voids, so that the brickwork behind the marble facing is kept dry.

The above recommendations have been implemented in so far only as they relate to the more urgent work on the marble facing of the drum and the dome and the inlay work on them, leaving the rest of the work to be taken up later when the report of the Committee has been finally approved by the Government of India. In this connection advantage was taken of the scaffolding to reset loose pieces of inlay work and restore the missing ones all over the necking, that is to say, immediately above and below the top of the drum.

During the course of the repairs an interesting detail of construction was brought to light. Behind the marble facing, wherever the surface of the brickwork core did not form an exact circle, it was trued up in the marble facing, the interval between the two, which varied in places, being filled up with lime concrete or with *lakhaurī* brick wedged vertically in lime mortar.

So far, the dead lime plaster from inside the dome has been removed only to a height of 10 ft. all round except on the west where it has been stripped to the full height of 61 ft., that is to say, right up to the red sandstone facing of the intrados of the dome. This also has revealed an interesting feature. Covering the entire surface of the lower part of the drum there is a regular and continuous series of eight relieving arches which adds to the strength of the structure. There are no cracks, worthy of the name, in the brickwork so far uncovered, but some cracks have been noticed higher up on the western side.

Briefly, the report indicates that, whilst much minor repair-work of a somewhat costly kind is necessary and should not be longer delayed, the Tāj is not in imminent danger of collapse and may not be essentially in a very much worse structural condition than when Prince Aurangzeb submitted his adverse report nearly three centuries ago.

THE CHRONOLOGY OF PREHISTORIC NORTH-WEST INDIA

By STUART PIGGOTT

The generalities of the Indus Valley culture, which, as first revealed by the excavation of Mohenjo-daro in Sind twenty years ago, dramatically extended the story of civilization in India backwards by nearly 3000 years, are familiar to all who are interested in India's past. The time has now come for the analytical study of that culture in relation to the other Asiatic cultures which are gradually being brought to light by exploration on the borders of India, in Iran and in Mesopotamia. Further work is also required at the classic sites of Harappa and Mohenjo-daro itself. We are still ignorant alike of the beginning and of the end of those great cities. Nor are we yet able to assess the extent to which India herself contributed to their development. In the present paper, Mr. Stuart Piggott discusses their relationship, cultural and chronological, with other Asiatic sites and cultures of the fourth and third millennia B.C.

INTRODUCTORY

THE area occupied by the prehistoric cultures discussed in this paper is enormous, stretching from the Himalayan foothills and the Waziristan uplands on the north to the sea from the Makran Coast to the Kathiawar peninsula in the south. Geographically this area is divided into two: the Baluchistan highlands on the west and the riverine plains of the Indus and the Punjab on the east. This structural duality of the land has dictated the type of prehistoric settlement, producing in the valleys of the difficult, dissected hill country a number of communities which share basic characteristics but which nevertheless have developed in comparative isolation one from another into clearly defined local cultures, while in the plains a uniform culture grew up and spread over the whole area. The comparative natural poverty of the hill country only allowed of the formation of small peasant communities, whereas the fertile plains gave the economic opportunity for the rise of a great urban civilization. In the Baluchi hills we have variety and poverty; in the Indus and the Punjab uniformity and prosperity.

The material available for the study of these early cultures comes from two sources, that obtained from controlled and at least moderately scientific excavation and that found on the surface of deserted settlements as the result of erosion, or in haphazard trenching for finds without regard to stratification. The excavated sites are few (Harappa, Mohenjo-daro, Chanhu-daro and some trial excavations by N. G. Majumdar in Sind) and as the two great cities showed practically no significant changes in culture from top to bottom of their deposits they do not contribute greatly to the stratigraphical evidence. The most abundant material available is pottery, and much of our sequence must depend on stylistic comparisons of decorative motifs. In describing a homogeneous group of pottery unassociated with other characteristic objects I shall use the word 'ware' coupled with a type-site name (e.g. 'Quetta Ware'), reserving the term 'culture' for the aggregate of comparable aspects of all manifestations of material culture (comprising e.g. buildings, burial-methods, pot-types, tool-forms) by which one group of people can be differentiated from another in the archaeological record. The cultures enumerated in this chapter have not hitherto been described or classified in detail, but are those which seem to me the minimum necessary after examining the published and unpublished material over the past two years. The basic work on these cultures was carried out by Childe (1933 and 1934)[1] but much new material from India and Iran is now available.

My purpose here is to discuss the chronology of these cultures in the logical stages by which such dating is built up, so that the reader can follow the process for himself. The first stage consists in determining the relative position of one culture to another by stratigraphy, which can be ascertained by scientific excavation and sometimes legitimately inferred from the reports of excavation which was not so scientific. We shall see that it is possible to observe or 'rescue' the stratification from half-a-dozen or so sites, and even if this only establishes relationships between a few of the cultures it must be remembered that this method is basic, and any discrepancies in the stylistic system must be rigorously checked against the stratigraphic evidence. This stylistic method, the comparison of significant types and styles of ornament between the cultures, is the second stage and one which is of considerable importance in this particular enquiry owing to the scanty evidence from excavation, and the correlation of the evidence from these two methods should give a working sequence within the Indian culture-province. This sequence can then be checked by the third method, comparison and equation between the Indian cultures and those of Iran and Iraq, where a mass of detailed stratigraphical and chronological evidence exists. The final summing-up from all the three lines of enquiry should give us the best picture available of the Indian culture-sequence in the present imperfect state of knowledge.

Although we may be able to construct a reasonable sequence into which the Indian cultures may be fitted in their mutual relationships, it is essential to remember the peripheral position of Western India with regard to the more ancient settlements of Iraq and Iran from which its cultures are derived, and to realize that correlations with these cultures to the west may only show the earliest date at which a given feature could have appeared in India. The time-lag may be considerable before a specific Iranian or Sumerian pottery-style was manifested in Baluchistan or on the Indus, and we must constantly bear in mind the 'zoning' of cultures beyond the primary centres, as Childe has emphasized in his discussion of the application of oriental chronology to the European prehistoric sequence. (*Amer. Journ. Arch.* XLIV (1939), 12–26.) In this connection the peasant cultures of Baluchistan may be subject to the same scaling-down in chronology as for instance the similar communities on the Lower Danube.

DEFINITION OF THE CULTURES

Apart from the dual division of the prehistoric cultures into the urban civilization of the Harappa culture and the peasant communities which comprise the remainder, on the grounds of pottery we can see a major division which equates with the Iranian cultures that were parental to those of India, a division into a Buff Ware province in South Baluchistan, which must be the easternmost extension of the equivalent south Iranian group, and a Red Ware region in North Baluchistan, again equating with a northern Iranian province. Within these major ceramic divisions, local cultures may be distinguished as follows:—

A. Red Ware.

(i) *The Zhob Culture.*—A group of peasant communities in North Baluchistan, mainly in the Zhob Valley. The pottery has a predominant but not invariable red slip with painted designs in black, with some use of red

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[1] For references to publications see Bibliography at end of paper.

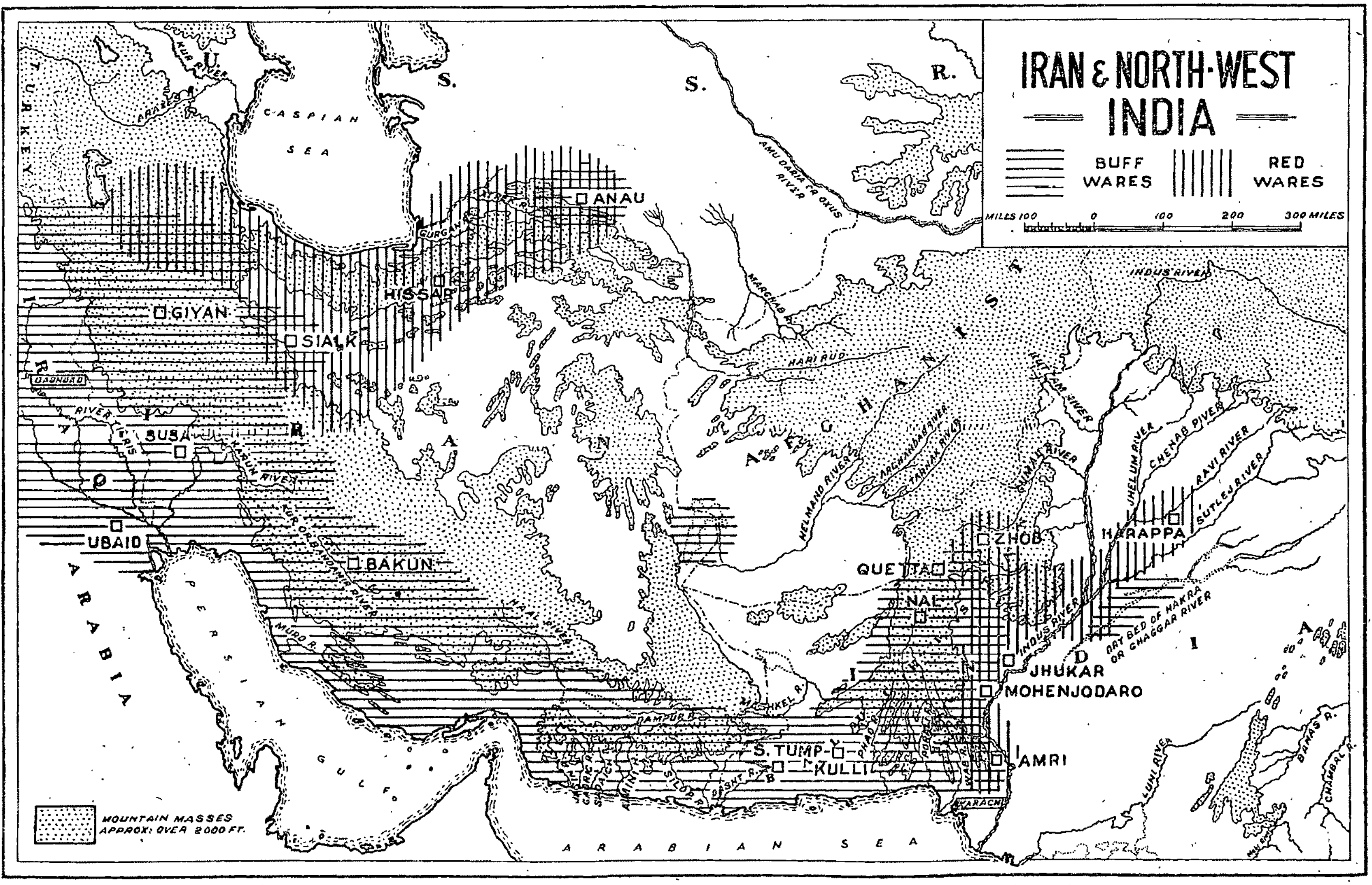

FIG. 1. *Map showing the general distribution of Buff and Red wares from Iraq to the Indus valley.*

lines as an additional colour. Buildings of mud bricks sometimes with stone footings, chert blades and arrowheads, use of copper not attested. Clay figurines of women and cattle, also phallic representations. Cremation burial. The main sites are Sur Jangal, Rana-ghundai, Mogul-ghundai and Periano-ghundai. (Stein 1929, *passim.*)

(ii) *The Harappa Culture.*—A complex urban civilization in the Indus Valley and the Punjab with at least two main cities, at Harappa and Mohenjo-daro, smaller towns (e.g. Chanhu-daro) and villages (many in southern Sind). In addition to abundant utilitarian plain ware it retains a painted pottery, black on a strong red slip. Buildings are of burnt bricks, elaborately laid out with wells, bathrooms, drains, etc. Copper and bronze common for tools, elaborately carved stone seals, sculpture in the round, large numbers of clay figurines. Although its pottery brings it under the Red Ware heading, the Harappa Culture has no obvious relationship with the Zhob culture in any other respect. (Marshall, etc. 1931; Mackay 1938 and 1943; Vats 1940; Majumdar 1934.)

(iii) *Cemetery 'H' Ware.*—A very distinctive black-on-red ware from a cemetery on the fringe of the town at Harappa, with no parallels elsewhere save for scattered sherds in top levels of the town itself. (Vats 1940.)

B. Buff Ware (all peasant communities).

(iv) *Quetta Ware.*—Black-on-buff pottery localized in the Quetta region; no use of red as a second colour, some bowls of fine grey ware with black painted ornament. (Publication pending.)

(v) *The Amri Culture.*—Localized in Sind and not definitely attested in South Baluchistan. Buff ware with black painted ornament and frequent use of red in zones or lines. Houses of stone, or of mud bricks or adobe with stone foundations. Chert blades, copper only attested in the form of beads. (Majumdar 1934.)

(vi) *The Nal Culture.*—In South Baluchistan with some sites in Sind. Buff ware with black painted ornament using not only red but often yellow and blue as additional colours. Stone and mud brick buildings, copper flat axes and knives, steatite seal, beads. Inhumation and fractional burials in large cemetery (Hargreaves 1929—Nal; Stein 1931—Nundara and other sites; Majumdar 1934—sites in Sind).

(vii) *The Kulli Culture.*—In South Baluchistan but with its influence at least felt in Sind. Buff ware with sparing use of red in addition to black paint. Stone and mud brick buildings, clay figurines of women and cattle, steatite vessels, copper pins and mirror, probable cremation burials. (Stein 1931—Kulli, Mehi and smaller sites.)

(viii) *The Shahi-tump Culture.*—Known from a cemetery in South Baluchistan. Buff or grey wares with black painted ornament and, at least once, additional red colour. Inhumation burials, copper shaft-hole axe, spear, copper stamp seals (Stein 1931).

(ix) *The Jhukar Culture.*—Known only in Sind. Buff ware with black and red paint. Houses of bricks (re-used Harappa). Copper shaft-hole axe, pins. Stone and clay stamp seals and 'bullae'. (Majumdar 1934—Jhukar and Lohumjo-daro; Mackay 1943—Chanhu-daro.)

(x) *The Jhangar Culture.*—Known only in Sind. Black or grey incised or burnished ware. (Majumdar 1934—Jhangar; Mackay 1943—Chanhu-daro.)

THE INDIAN STRATIGRAPHY

We have thus ten cultures in all to evaluate and to place in their correct chronological order. Let us begin by studying their relationships within India, and first by considering the direct evidence of superposition of cultural levels observable in excavations—evidence which is critical but all too limited in extent. At Amri, Lohri and Pandi Wahi (Majumdar 1934, pp. 24, 65 and 91) Amri culture settlements were found stratified beneath Harappa culture occupation levels, and at Ghazi Shah (*ibid.*, p. 79) the same sequence was observed but with an overlap of pottery types and not as in the other sites a decisive break. At Chanhu-daro, Mackay was able to distinguish a very important sequence of five occupation levels, of which the earliest three were successive rebuildings of a Harappa town, the fourth of the Jhukar, and the fifth and latest of the Jhangar culture (Mackay 1943). Following the normal practice I propose naming the occupations at Chanhu-daro as follows, beginning with the earliest occupation found (virgin soil was not reached). (cf. Piggott 1943, p. 179.)

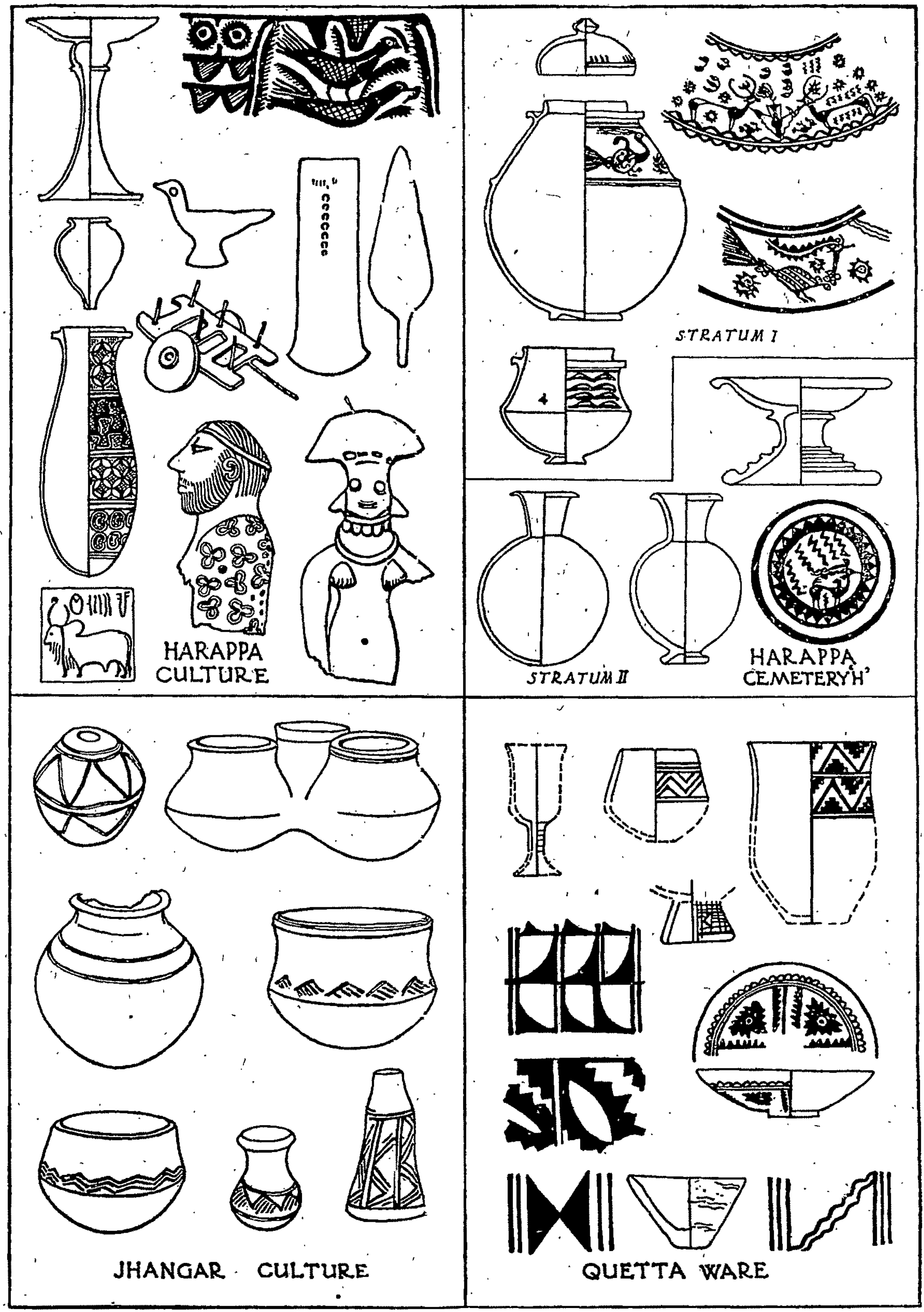

FIG. 2. *Prehistoric cultures from north-west India.*
(*Not to Scale.*)

Chanhu-daro Ia	Harappa Culture
Chanhu-daro Ib	
Chanhu-daro Ic	
Chanhu-daro II	Jhukar Culture
Chanhu-daro III	Jhangar Culture

A similar superposition of the Jhukar culture upon a Harappa occupation had been found by Majumdar at the type-site and at Lohumjo-daro. (Majumdar 1934, pp. 5 and 48.)

At Mohenjo-daro no significant changes in culture were found in all the nine or ten building periods, but at Harappa burials in the 'H' Cemetery, itself of two periods, had been dug partly into a rubbish-tip on the edge of the town (Vats 1940, p. 228 and personal observation on the site). This cemetery is therefore presumably later than the main occupation of the city.

The Shahi-tump burials had been made into the summit of a small tell which consisted of at least two building levels of the Kulli culture and which also yielded a fragment of a clay toy cart of Harappa type. The cemetery is therefore subsequent to the Kulli and Harappa periods (Stein 1931, p. 88 and section on pl. 7. Cart fragment on pl. XIV, Sh. T. ii. 12).

At Nal again the cemetery had been made into the uppermost ruins of a tell, the occupation levels of which yielded scanty material which seems, however, to relate to the Zhob culture, with probable Kulli elements. The Nal burials therefore are later than the Zhob culture and perhaps than the Kulli culture. (Hargreaves 1929, pp. 17ff. For pot with applied wavy ornament, pl. XIX, 19 and presumed to be that shown in the section pl. VIII, cf. Stein 1931, fig. 42, from Kulli.)

In one of his last explorations Sir Aurel Stein found, at Sardanawalla on the dry Ghaggar River, a buff ware culture probably allied in the main to Quetta ware, stratified below a Harappa occupation in a large tell. (Stein 1942 and information from Mr. Krishna Deva.)

Summing up this evidence we find that, taking the Harappa culture as a central point, we have established the Amri culture and probably Quetta ware as earlier, the Kulli culture as partly at least contemporary, and Jhukar, Shahi-tump, Cemetery 'H' and Jhangar as subsequent. Nal may be partly contemporary and partly later—we may notice here the sherd of Nal ware in the Jhukar level at Lohumjo-daro (Majumdar 1934, p. 57, confirmed by examination of the sherd). With this outline sequence established, we may go on to our second method of examination, namely, the consideration of stylistic comparisons between the cultures.

STYLISTIC COMPARISONS WITHIN THE INDIAN CULTURES

We must remember that a general similarity in such stylistic features as pottery-decoration need not necessarily imply contemporaneity, but may involve a relationship in which one culture is ancestral to another at some remove of time. On the other hand we may say with some confidence that specific and detailed similarity may well establish a presumption of chronological equality. With these limitations in mind we can turn first to the Zhob culture and consider its Indian analogues. We have first to make an internal division within the material assigned to the culture, based on pottery-typology and confirmed by stratigraphical evidence observed in exposures made by agricultural digging in the Rana-ghundai tell (notes made by Major M. F. C. Martin in 1940). Here a most distinctive ware found typically at Sur Jangal (Stein 1929, p. 70), with stylized bovids and caprids, red-and-black ornament, and surface not invariably coated with red slip, was found stratified below sherds more of the types seen at Periano-ghundai in the same region (Stein 1929, p. 33), where animal ornament is very rare and the red slip constant; but there is not sufficient

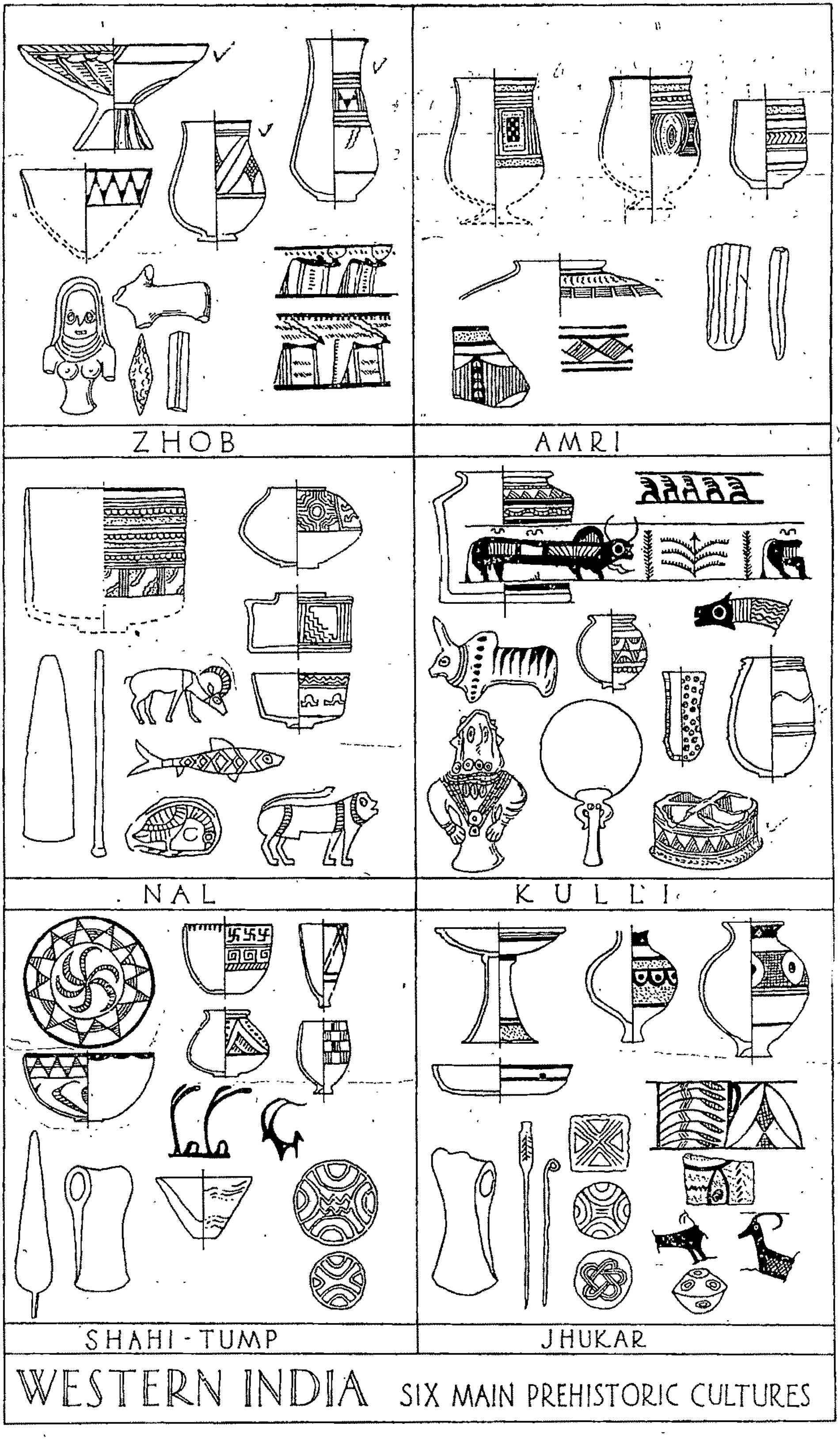
ZHOB
AMRI
NAL
KULLI
SHAHI-TUMP
JHUKAR
WESTERN INDIA SIX MAIN PREHISTORIC CULTURES

FIG. 3. (*Not to Scale.*)

evidence to separate these wares into distinct cultures, and they are treated here as two phases of the Zhob culture. Much of the simple geometric ornament in Zhob ware can be matched in the Amri culture: more precise comparisons can, however, be made between the panels of chequer ornament framed with red and black lines, common to both (cf. Stein 1929, pl. VI, p. 62 and pl. XXI, S.J. 37 with Majumdar 1934, pl. XXIV, 31 and pl. XXV, 2) and the same two-colour motif occurs in South Baluchistan on a form of Nal ware (Stein 1931, pl. XX, Hor. 2 and Jar. 1). The pedestal feet with vertical painted stripes (Stein 1929, pl. XX, S.J. v. 1, S.J. ii. 5—from Sur Jangal) again occur at Amri and Pandi Wahi (Majumdar 1934, pl. XVII, 13 and unillustrated sherds—P.W. 190 and 233—in the Central Asian Antiquities Museum, New Delhi). These rather precise correspondences should imply at least a temporal overlap of the Zhob and Amri cultures, and to this too may point the extensive use of chert blades in both cultures (though these also occur in the Harappa culture). The presence of figurines of women and cattle in both the Zhob and Kulli cultures is interesting in view of their absence in Amri and Nal, but here a common origin of an idea seems the link, since the female figurines have very dissimilar treatment in the two cultures. The dimensions of mud bricks in the Zhob culture (13×7×2½ in. at Rana-ghundai—Stein 1929, p. 52) do not seem paralleled elsewhere in Baluchistan. The rite of cremation, which seems well attested in the Zhob culture (e.g. at Periano-ghundai —Stein 1929, pp. 33ff) may also have existed in the Kulli culture (Stein 1931, pp. 154ff—at Mehi).

While on economic grounds the Harappa culture stands unparalleled among the Indian sites as a complex urban civilization in contrast to simple peasant economies, there are nevertheless a number of points which may be noted in the comparison of details. The question is rather confused by the presence of Harappa 'colonies' or trading marts in, e.g. South Baluchistan, and what may appear parallelisms may be actual Harappa objects exported thence from the Indus; but these can mostly be detected and still leave an important residuum of true cultural contacts. Curiously enough, save for the use of deep red slip, the pottery of the Harappa culture has no analogues in the Zhob material, such parallels as there are being to motifs lying to the south rather than to the north. In the following notes of what appear to be significant parallels, references to Harappa types are not given if they are very well known.

Most interesting are the connexions between the Harappa and the Kulli cultures. Certain common pottery motifs occur in both cultures—compare the double-branching tree pattern (e.g. Vats 1940, pl. LXIX, 1 and 4) with that at Kulli (Piggott 1943, fig. 3), or the broad 'banana' leaves (Mackay 1937, pl. LXVIII, 26) with those on a sherd from a probable Kulli site (Stein 1931, pl. II, B.R. 2). The common Harappa 'pipal-leaf' motif is seen on Kulli sherds such as, e.g. Stein 1931, pl. XXX, Mehi ii. 4, 5, and the tree as the central motif of a saucer (*ibid.*, Mehi ii.i.5) recurs at Harappa (Vats 1940, pl. LXIX, 10). I have elsewhere pointed out (Piggott 1943, p. 176) that the 'sacred brazier' of the Harappa seals is represented on a sherd of Kulli ware. The cross-hatched treatment of animals' bodies in Harappa ware is a not infrequent Kulli technique (Stein 1931, pl. XXIII, Kul. v. 3; Kul. v.vii.2). At Ghazi Shah in Sind, the Harappa material included red-slipped ware with animals and trees painted in a quite distinctive Kulli technique (Piggott 1943, p. 176). Finally there appear at, for instance, Mehi offering-stands of Harappa forms but in the Kulli painted ware (sherds inadequately illustrated in Stein 1931, but examined in the Central Asian Antiquities Museum, New Delhi). Perforated vessels of Harappa type such as Stein 1931, pl. XXV, Kul. 1. viii. 3 seem too common on Kulli sites to be imports, and we may note pottery 'bird-whistles' of Harappa types but again in Kulli painted ware (e.g. Stein 1931, pl. XXIX, Mehi ii. v. i. and ii. 22) and cart models as noted by Childe (1934 p. 272).

Further correlations between Kulli and Harappa are seen in the clay figurines of women. While the Harappa figurines are, as a group, *sui generis,* they do come stylistically nearer to the Kulli than to the Zhob group (note the pinched-up faces and cf. the neck ornaments on Mackay 1937, pl. LXXV, 10, 17, 19 with Stein 1931, pl. XXI, *passim*). The Kulli figurines wear conical ear ornaments (not clearly visible in the published illustration) which are the Harappa type of Vats 1940, pl. CXXXVII, 2 (gold) or pl. CXXXVIII, 29 (pottery), and the style of hair-dressing of many figurines of the Kulli culture (again not seen in the published illustrations) is exactly comparable with that of the famous Dancing Girl bronze from Mohenjo-daro, who also has the left arm loaded with bangles but only a couple at the right wrist as have the Kulli figurines (e.g. Stein 1931, pl. XXXI, Mehi iii. 5. i. and iii. 2.2.). Finally we may note in passing handled copper mirrors in both cultures (Mackay 1937, pl. CXIV, i. and CXXX, 25, and Stein 1931, pl. XXXII, Mehi 11. 2. 1a) and end with the decorated and compartmented steatite boxes from Mohenjo-daro and the Kulli culture (Piggot 1943, with refs.). The cumulative effect of these parallels of the Harappa culture with that of Kulli is impressive; at least it must mean that the Harappa folk had mercantile relations with the Kulli people to a degree unshared by any other of the provincial cultures, and it may indicate a closer relationship, as we shall see below when dealing with the final chronological assessment of the cultures.

Two other cultures have, however, some evidence of Harappa contacts. At Nal not only was there a pot with the Harappa intersecting circles motif (Hargreaves 1929, pl. XXd), and others with pipal leaves, but a stone weight (*ibid.*, pl. XVb), small disc beads (p. 34) and the use of whitened steatite for a seal (p. 32) all point to Harappa, as perhaps do the copper spear types (though not the axes). The Jhukar culture, stratigraphically fixed, as we have seen, as post-Harappa, shows several points of contact with the earlier culture, such as the use of offering stands and some not very explicit resemblances in pottery ornament. (cf. Mackay 1943, *passim.*)

No parallels can be cited for the Cemetery 'H' ware. I have elsewhere indicated a possible source for some of the patterns in Kulli ware (Piggot 1943, 179n).

Turning now to the buff ware group we find that Quetta ware, while it has a generalized resemblance in the simpler geometric motifs to Amri, Zhob and Shahi-tump, really stands by itself and has no Indian parallels for its large free geometric designs and the complete absence of ancillary red ornament. A fine thin grey ware with black painted ornament found on the Quetta sites has parallels at Sur Jangal (Stein 1929, pl. XX, S.J. v. i. 7 and 19) and the buff ware found by Stein in the Ghaggar River region seems likely to be related. But so little is known of the content of the Quetta culture except its pottery that comparisons are difficult and may be misleading in the present state of our knowledge.

We have already noted the connexions between the Amri culture and that of the Zhob Valley, and seen that one characteristic motif, the chequered panel within a black and red frame, recurs also on sherds apparently belonging (as we shall see below) to an early stage of the Nal culture. There is in fact a general similarity between Amri ware and this Nundara ware of South Baluchistan (cf. the Amri sherds illustrated in Majumdar 1934 with those from Nundara and neighbouring sites in Stein 1931) and in both red is the only additional colour used. The small rather crowded drawing of the designs contrast with the freedom of Quetta ware, and both Amri and Nal share in a total absence of clay figurines.

The Nal culture, as indicated in the preceding paragraph, seems susceptible of a stylistic division into two—an early phase, typified by Nundara, having some Amri affinities and only using red in addition to black, and a later phase as at the type site of Nal with full polychromy in black, red, yellow and blue. We have noted a few Harappa contacts, but, generally speaking, the Nal pottery is highly individual and strongly characterized, particularly in its typologically mature productions. But there are signs of contact with Kulli—the beasts on Nundara pottery with striped bands across their loins and forequarters (e.g. Stein 1931, pl. XXV, Nun. iv. 12) may be compared with the painted clay figurines of cattle in the Kulli culture, similarly banded (e.g. Stein 1931, pl. XIV, Sh.T. ii. 17), and the odd cylindrical 'cannister' from Nal (Hargreaves 1929, pl. XVI, Type 5) seems likely to be a stylized form of the squat bottles from Kulli (Stein 1931, pl. XXIII, Kul. 1. viii. 1 and 1. vii. 4), so at least the Nundara phase may run parallel with Kulli. The inhumation burials at Nal with their large arrays of pots as grave-goods suggest comparison with the Shahi-tump cemetery, and a copper seal from Nal (not directly associated with the cemetery) (Hargreaves 1929, pl. XVd) is certainly paralleled at Shahi-tump (Stein 1931, pl. XIV, Sh.T. vi. 29). Mud bricks at the Nal cemetery and at Nundara measured 21×9×3½ in. and 21×10×4 in. respectively (Hargreaves 1929, p. 27; Stein 1931, p. 143) and these dimensions compare with the mud bricks 23×9×3¾ in. which apparently belong to the Zhob culture settlement underlying the cemetery at Nal (Hargreaves 1929, p. 29—other mud bricks in the settlement measured 12×12×7½ in.) and with those 19×10×3 in. in the final building period of the Kulli settlement at Shahi-tump (Stein 1931, p. 97 and pl. 7), and 21×10×3 in. at Dabar Kot in a Harappa context. (Stein 1929, p. 59.)

We have discussed the Harappa element in the Kulli culture above: the pottery examined as a whole suggests that the Harappa influence began to appear when the characteristic animal ornament was already mature. This ornament is totally distinct from the technique of the animal ornament of Nal and Nundara (though a connexion with Nundara via the painted figurines is noted above), and, apart from sharing in the common stock of geometric motifs and the use of red bands with Amri, no other contacts can be noted within the range of the Indian cultures.

The Shahi-tump cemetery presents a large pottery series which, with a few scattered finds from settlements adjacent such as Parom and Nazirabad, stands alone among the Indian wares except for vague resemblances to Quetta ware not substantiated in detail. The burial-rite compares with that of Nal, but the most precise parallels occur in the Jhukar culture—shaft-hole copper axes (Stein 1931, pl. XIII, Sh.T. vii. 135; Mackay 1943, pl. LXXII, 25) and seal designs (Stein 1931, pl. XIV, Sh.T. ii. 20; Mackay 1943, pl. XLIX, 2 and pl. L, 7), while we have noted another parallel in a seal from Nal. The Shahi-tump spear (Stein 1931, pl. XIII, Sh.T. vii. 12. d. i) is a Harappa type.[1]

The Jhukar culture presents a curious and intriguing mixture of elements in the pottery, in which Baluchistan styles seem confused and modified. The offering-stands (Mackay 1943. pl. XLI) suggest a Harappa or late Kulli origin, and from Kulli too should come the characteristic double branched tree motif as in Mackay 1943, pl. XLVII, i. and several others, while the wide loops on the edge of a saucer (Mackay 1943, pl. XLIII, 5–8) is again a Kulli motif (cf. Stein 1931, pl. XXIII, Kul. v. i. 6; pl. XXVIII, Mehi. i.i.i.). The use of black and red paint carries on what we have seen to be a long-established Baluchi tradition, and the slack execution of the designs recalls the carelessness of much Harappa vase-painting, and a cross-hatched animal (Mackay 1943, pl. XLV, 22) points in the same direction (or to Kulli). There is no evidence that I can see for Mackay's claim that the copper pins with rolled heads in Chanhu-daro II are a survival from the Harappa occupation of Chanhu-daro I.

What little we know of the Jhangar culture shows a complete break with the painted pottery tradition, and there are no parallels that can be cited for the grey and black pottery.

The sum of information from this line of enquiry agrees well with that derived from the extant stratification and amplifies it to some extent. Quetta, Amri and at least the earlier phase of the Zhob culture are difficult to distinguish chronologically one from another, though the absence of red paint in Quetta ware separates it to some degree, and as all are free from Harappa influence they should antedate that culture. Amri should overlap with the earlier phases of Nal (Nundara ware) and with this phase too Kulli should partly coincide, overlapping largely with Harappa though earlier in origin. Nal may run partly parallel with Harappa in its nature phase but probably survives later, even perhaps into the period of Shahi-tump which is definitely post-Harappa and contemporary with Jhukar. The Jhangar culture is the latest of the series and marks a very distinct cultural break.

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[1] The published illustration of this and of the axe are very misleading and do not show the true shapes.

THE INDIAN CULTURES IN THEIR WIDER SETTING

Finally we must extend our field and assess our local Indian culture-sequence in relationship with the prehistoric sequence of Iran and Iraq, where adequate excavation and intensive comparative study over a number of years have together produced a sound chronological sequence and a fair idea of the interlocking cultures involved. It must be noted that all evidence is consistent with the ultimate derivation of the prehistoric cultures of north-western India from Iran, where settlements showing an already well-formed peasant culture are known from at least the fifth millennium B.C. Dating in solar years can in Iraq be made with confidence after the beginning of the early dynastic period very near 3000 B.C., but when dealing with cultures remote from the Sumerian culture-province any such dating must be used with great reserve and cultural equations are more important and significant.

In the ensuing section it will be necessary for the reader to have an outline acquaintance with the classic sequence of prehistoric and Early Dynastic Sumer, and also with the culture-sequences of some of the main sites in Iran and adjacent regions such as Sialk, Giyan, Hissar, Susa and Anau. For details he will have to refer to the original excavation reports or to compilative summaries, the essential work for Iran being McCown 1942. The Mesopotamian sequence is conveniently summarized with graphic tables in Seton Lloyd's *Twin Rivers* (1943). The Mesopotamian dating after 3000 B.C. in terms of precise years has to be completely revised following Sidney Smith's *Alalakh and Chronology* (April, 1940) though Albright's dates as given by Seton Lloyd (op. cit., p. 39) approximate to these revisions. Dates given in earlier publications must be discounted.

The nomenclature of the main prehistoric periods in Iraq was decided on by the Leiden Conference of 1931, when the terms Al Ubaid, Uruk and Jemdet Nasr were selected from convenient type-sites to denote the three distinctive cultures which precede the earliest Sumerian dynasties. Later discoveries showed that agricultural village communities antedated that of Al Ubaid in Iraq, and that the earliest of these were actually with no knowledge even of elementary copper-working, and the chalcolithic Tell Halaf and neolithic pre-Halaf periods were therefore constituted. So far as our knowledge goes at present the Iraq sequence runs as follows:—

1. *Pre-Halaf.*—Probably in the main without metal. Various cultures are just being distinguished, such as the lowest of the occupations at Nineveh (Ninevite I), the lowest archaic level (f) at Tepe Gawra and most important, the site at Tell Hassuna dug in 1944 by Seton Lloyd (*The Times*, 15th June, 1944). Date from perhaps 5000 B.C.
2. *Tell Halaf.*—Early use of copper, and the appearance of the very distinctive polychrome Tell Halaf ware, with stone and mud brick buildings. Another pottery, Samarra ware, is probably mainly contemporary though at Tell Hassuna it is pre-Halaf. All these sites, and those of pre-Halaf times, lie in northern Iraq, since the head of the Persian Gulf probably extended at this time to a point fifty miles north of Baghdad. The main type-sites are Tell Halaf itself (pre-Hittite occupation), Arpachiyah (levels VI to X) and Samarra (prehistoric graves beneath the Abbasid town of IX A.D.). Date from perhaps 4500 B.C.

3. *Al Ubaid.*—Settlements and cemeteries, stone, mud brick or pisé houses, painted pottery, some use of copper, stamp seals. At Ur the 'Flood' occurred during this period. Main sites are Ubaid itself, Gawra levels XIII to XIX, Ur, Uruk levels IX to XVIII, and Uquair. Persian Gulf now probably extending to 120 miles north of Basra. Date from perhaps 4000 B.C. or a little later.

4. *Uruk.*—Settlements and the first temples, cylinder-seals, first writing, sculpture in the round, wall-paintings, intrusive polished red and grey pottery. The type-site is Warka (Uruk) levels V to X, other sites are Gawra VIIIB to XI, Nineveh IV to III, Uquair V to VIII. Date from perhaps 3500 B.C.

5. *Jemdet Nasr.*—Settlements, temples, but mainly identifiable by painted pottery using black and red paint. The phase is recognizable at Ur, Uruk II to III, Gawra VII to VIII, Uquair II to IV and other sites. Date somewhere immediately before 3000 B.C.

6. *Early Dynastic.*—This phase is the Archaic Sumerian of Childe 1934, and is divided into three phases. The true beginnings of Sumerian culture are first seen here, and dynastic lists date from this time. Towns, temples, the Royal Tombs of Ur (Early Dynastic III). Inscriptions and other written (cuneiform) documents from now on provide actual history. Date from 3000 B.C. onwards through the historical dynasties.

For the regions east and north-east of Mesopotamia no inclusive classification such as the foregoing has been worked out, and we have instead to refer to the sequence of stratification on several separate sites. *Tepe Sialk*, near Kashan, contains four distinct cultures of which Sialk I with four occupation levels may in its earliest stage be formally neolithic and is certainly pre-Halaf, and contains painted pottery already showing at least two cultural strains, pisé houses and crouched burials. In Sialk II, contemporary with Halaf and Samarra ware, this culture develops but also contains innovations such as mud bricks, new pottery designs, and imported objects from the Persian Gulf and elsewhere. There is a gap between this settlement and Sialk III, which is a thick deposit with eight sub-levels and runs from early Ubaid to mid-Uruk times, containing some features derived from Sialk II, but by III 4 and III 5 a full Copper Age is apparent, with cast tools and other developments, such as the increased use of stamp seals, and with mud brick buildings having buttressed walls as in the White Temple of Uruk and at Uquair in the Uruk period. Sialk IV is a short occupation separated by a gap from III, and is of the Jemdet Nasr period with characteristic bichrome pottery and early inscribed tablets. See R. Ghirshman, *Fouilles de Sialk* (Musée du Louvre, Paris, 1938-39).

Tepe Giyan near Nihavend is a large 'tell' having a succession of five cultural periods unfortunately numbered in the reverse order from Sialk and most other sites, so that Giyan V is the earliest of the series. This level, about 35 feet thick, is divided into four sub-levels A, B, C, and D (from the bottom upward) and covers a period from early Halaf (VA) to mid-Uruk (VD), VC being in the main contemporary with Ubaid. By VB houses of pisé on stone foundations appear together with metal objects—in VC an axe and chisel that had probably been cast and equate with the similar objects in Sialk III 4 and 5. The painted buff ware which occurs throughout shows affinities with Sialk III and, in VD, with red ware from Hissar I (described below). There seems to be a gap covering a period from mid-Uruk to early dynastic times, and Giyan IV covers a period approximately early dynastic to Akkadian (3000 to 2300 B.C.), with a socketed copper axe, a cylinder-seal, and pottery similar to Susa D (see below). The remaining three levels range in time to about 1100 B.C., and the appearance of iron. See G. Contenau and R. Ghirshman, *Fouilles du Tepé-Giyan* (Musée du Louvre, Paris, 1935); and M. Mallowan, in *Antiquity* XI (1937), 506, 510.

Tepe Hissar is a 'tell' near Damghan containing three main occupational levels, each divided into three sub-levels. Hissar IA, the earliest, does not seem to be earlier than the beginning of Ubaid times, while IC overlaps into mid-Uruk. Pisé and probably mud brick buildings, burials and stamp seals, with cast metal tools in Ic, together with painted pottery, give equations with Sialk III and Giyan Vc and Vd. Hissar II is a transitional period in which the old painted-pottery tradition is superseded by a plain burnished grey or black ware and other innovations in metal types (e.g. double spiral headed pins) show the intrusion of a new people into the area is a period from mid-Uruk to the end of Jemdet Nasr times at least. Hissar III, which from buildings and graves shows the grey ware people completely established, is dated by McCown as from Early Dynastic to Akkadian, but I cannot see that such a high dating can be defended, and the Indian evidence certainly runs counter to it, as shown below. To my mind it is difficult to place the beginning of Hissar III much before 2000 B.C. (Schmidt 1937; Piggott 1943).

The sequence of prehistoric settlements in the great mound of *Susa* was not clearly apprehended by the original excavators, but McCown has proposed a plausible scheme into which the material can be fitted. The earliest settlement and burials on the site between −9 and −12 metres have long been known as 'Susa I'. Stylistic comparisons show this phase to be contemporary with Ubaid, Hissar I, Sialk III and Giyan Vc. McCown would call this phase A: his phase B (with characteristic pottery) equates with Uruk and lies between −9 and −3·8 metres. Above this (−3·8 to 0) are two strata, one, phase C, contemporary with the Jemdet Nasr period, and the other, D, contemporary with early dynastic and characterized by the so-called 'Susa II' painted pottery. (McCown 1942.)

The site of *Anau* in Russian Turkestan has three main periods of occupation, the first being divided into two phases. Anau IA appears to be of Halaf date, contemporary also with Giyan Va and with Sialk II, with which it has cultural connexions in its painted pottery. Anau IB, in which copper pins, etc., first appear, carries on the painted-pottery tradition through Ubaid into Uruk times, and is contemporary with Hissar I, Sialk III, Giyan Vc and Susa A. By the end of Anau IB grey ware appears mixed with the painted pottery, and these continue side by side in Anau II. New elements also appear in the painted wares at this time (buff ware and polychrome types), which might be derived from Baluchistan (e.g. Quetta ware and the Zhob culture). In general, Anau II is considered by McCown to equate with Uruk-Jemdet Nasr, Hissar II and Susa B and C, and Anau III, in which clear cultural connexions with Hissar III are apparent, should approximate in contemporaneity with the latter culture. This on McCown's showing is, as I have said, put in a chronological position difficult to reconcile with all the evidence, especially that from India. (Pumpelly 1908; McCown 1942.)

A final Iranian site to which reference is made below is that of *Tall-i-Bakun* at Persepolis in Fars Province. Here the earliest culture, Bakun B, is considered by McCown to be pre-Halaf in its earliest (BI) stage and contemporary with Halaf in BII. The later (A) levels begin with AI in early Ubaid times overlapping with Uruk in the final (AV) phase (Langsdorff and McCown, *Tall-i-Bakun A, season of 1932* (1942); McCown 1942).

These Iranian cultures have been grouped into two main divisions by McCown on the basis of their painted pottery, the red ware cultures (Sialk I to early III, Anau I, Hissar I and another site, Chesmeh Ali, in the same region) and the buff ware cultures (Giyan V, Susa A, Bakun, Halaf, Samarra, Ubaid). This dual division has already been referred to and I have divided the Indian material accordingly, and we may now go further and attempt a more detailed assessment of our local cultures against those of the west.

The early (Sur Jangal) phase of the Zhob culture is as I have shown elsewhere (Piggott 1943, p. 169) directly comparable with the Hissar I culture of north-eastern Iran and may be considered as a parallel manifestation with its more precise analogues lying in Hissar Ic, and should be approximately contemporary on this showing with Susa I, Giyan Vc, Sialk III, Anau IB and the Al Ubaid period in Sumer.

The position of the Harappa culture in the chronological sequence can be defined fairly satisfactorily in relationship to Sumer. I have discussed this problem elsewhere (Piggot 1943 with refs.) and shown that the critical objects for dating purposes, the steatite seals of Indian manufacture or inspiration, have almost all been found in Akkadian or later contexts, and the allegedly 'Indus' objects or influences seen in Early Dynastic settings are as well or better referred to the Kulli culture.

The objects of definite or suspected Indian origin in Sumer fall into two groups—an early dynastic series (*c.* 3000 B.C.) and a later group centred chronologically on the period of Sargon of Akkad (*c.* 2300 B.C.). The earlier of these groups comprises a number of interesting features—steatite vessels of types characteristic of the Kulli culture in the Makran occur on at least eight sites in Sumer and Elam and where the context has been recorded (in five or six instances) this has been Early Dynastic. Sites of this date in the Diyala region north-east of Baghdad have yielded further evidence of Indian contacts—a bull-worship scene on a painted 'scarlet ware' vessel and a fine humped bull carved in relief on a steatite vessel in other respects of Sumerian decoration—and in Susa D of McCown's classification (the old 'Susa II' and equated with Early Dynastic times) are clay figurines of humped bulls. In view of the close connexion between the early dynastic 'scarlet ware' and Kulli ware noted below, I should regard all these features as evidence of connexion between Sumeria and the Makran, rather than the Indus Valley, at this early period.

At least thirty steatite seals have been found in Sumer either carved with decisively Indian motifs or of actual Harappa types in form and in the subject-matter of the scene carved on them, while several have Harappa script as well. Of the dozen or so of these which have been found in contexts that can be dated, only two can be dated before the dynasty of Akkad (and those not very convincingly), while seven are certainly Akkadian in date and three even later. Of Akkadian date too are the objects found at Tell Asmar with two seals of Harappa type or derivation—kidney-shaped bone inlays, etched carnelian beads a drawing of a humped bull scratched on clay, and 'knobbed' pottery fragments, all characteristically Harappa types, and it has been suggested that the unusual arrangement of bathrooms and drains in an Akkadian building at Tell Asmar are also inspired by Indian ideas. At Tepe Gawra near Mosul were found in Akkadian contexts several objects suggesting Harappa derivation, including a seal of a die with a peculiar system of 'spots' in the Indus Valley manner (reference to all the above finds in Piggott 1943, pp. 176–178).

In the Harappa culture itself, the possible Sumerian contacts are exceedingly few, not all convincing and all of types that survive from Early Dynastic to Akkadian or later times except for a significant find in the lowest level at Mohenjo-daro of a fragment of a carved steatite box of Kulli origin, known in Sumer only in Early Dynastic (and probably E. D II) contexts. (See below.) I therefore place the beginning of the Harappa culture in mid Early Dynastic times and since we have the good evidence of Harappa imports in Sumer in Akkadian times, and since the twenty feet of deposits at Mohenjo-daro, with nine building-levels, must represent a considerable period of time, especially with burnt brick buildings, I do not see that the end of the culture can be placed before the Third Dynasty of Ur or even Isin-Larsa times. It is here that we enter on controversy which cannot at present be resolved, and that is the correlation of the Indian sequence with that at Hissar and Anau as interpreted by McCown. These difficulties have been pointed out in my paper cited above. The main points are: first, the occurrence in Chanhu-daro I of a double spiral headed pin of Hissar II type and in the ensuing Chanhu-daro II occupation of several roll-top pins of Hissar IIIB forms; secondly, the copper mattock of Hissar III type found in the uppermost level at Mohenjo-daro. A third point is the correlation detailed below between the Jhukar and Shahi-tump cultures with Hissar III and Anau III. The evidence for a parallel sequence in which Harappa equals Hissar II and Jhukar/Shahi-tump equal Hissar III/Anau III would seem then very plausible, but on McCown's dating this would mean that the Harappa period would end, not begin, in Early Dynastic times,

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and as we have seen the other evidence will not admit of this. As a revision of the dating of Hissar cannot be entered on without a complete re-examination of the whole sequence of Iranian prehistoric cultures, we must be content here to note the inconsistency and to leave the working out of the problem for another occasion. I think that Harappa may well overlap Hissar III and that it may span late Hissar II/early Hissar III times (the animal-headed pins and other features common to Harappa and Hissar III that I have noted—1943, p. 181—should have some weight); but that it begins earlier than mid or even late Early Dynastic times I cannot see as a probability, and its persistence into Akkadian times is attested by such clear evidence as the famous Tell Asmar group of finds of that date.

Turning to the Indian representatives of the buff ware group, Quetta ware has good equations implying a parallel date to Sur Jangal ware and possibly one rather earlier in view of the absence of ancillary red paint, which does not occur on the early buff wares outside Baluchistan except at Anau II, where it may be susceptible of Indian inspiration (cf. McCown 1942, p. 58). Quetta ware is still unpublished, but shows significant types occurring in Bakun A III and IV, Giyan VB–D, Sialk III 5–7, Susa I and Ubaid (see McCown 1942, *passim*) and also to Anau II (Pumpelly 1908, fig. 135). Of all the Baluchistan wares, that from Quetta stands nearest to the Iranian buff ware analogues and should I think represent one of the earliest cultures in north-west India.

Amri ware, while sharing a large number of motifs with the buff ware group at large and having its nearest analogues in Ubaid rather than in the Iranian facies of the group (cf. Speiser 1941, p. 164), has the use of red paint and a certain tendency to a rather niggling execution to separate it from the free monochrome treatment of its analogues. In fact it gives the impression of a descendant rather than a true contemporary of the Ubaid culture and it is difficult to make a strict chronological equation.

The tendency to a 'tight' technique of drawing and a consistent use of additional colour serves to isolate the Nal culture even more from the western buff wares, and it must take its place as a highly specialized derivative even further removed than Amri, though striking resemblances to early types may remain (cf. for instance, Hargreaves 1929, pl. XVIII, 10 with Mecquenem 1912, fig. 135). The firm naturalistic outlining of animals on Nal ware recalls Early Dynastic art traditions (cf. Hargreaves 1929, pl. XVIII, 9; XXI, 8, 14, with Woolley 1935, *passim*).

With the Kulli culture we move a stage forward from generalized resemblances within the buff ware group to direct and explicit correlations with Early Dynastic Sumer. I have elsewhere discussed in detail the parallel manifestations of Kulli ware and the 'scarlet ware' identified by Frankfort and known from the Diyala region to Khuzistan, and the collateral evidence of the steatite boxes made in the Makran and exported to Sumer and Elam (Piggot 1943, p. 174). A link with Khuzistan is again provided by the files of caprids on Kulli ware and on sherds from the Musyan sites (cf. Stein 1931, pl. XXI, Kul. 1. iv. 3 and 4; XXVII, Mehi 2 and others, with Gautier-Lampre 1905, *passim*), while the use of red as a second colour and naturalistic animals with cross-hatched bodies links up with 'Susa II'. In fact the Kulli culture, or at least its formative influences, seem to show direct contact between South Baluchistan and the head of the Persian Gulf in Early Dynastic times—contact which must have been by sea, since the intervening region of land, though explored by Stein, has yielded no comparable remains but only a long-persisting buff ware culture of Susa I—Bakun derivation (cf. Stein 1936, 1937 and 1940), and Kulli influences are indeed perceptible in these Iranian cultures on the easternmost fringe, showing that they survived here at least into Early Dynastic times. (Steatite and allied vessels at Bampur, Katukan, Khurab and Seistan—refs. in Piggott 1943, p. 176 n; in the Khurab cemetery pots as in that at Mehi—Stein 1937, pl. XXXIV, 2 and 4, cf. *ibid.*, 1931, pl. XXX Mehi iii.1.63; 1937, pl. XXXII, 9, cf. 1931, pl. XXX, Mehi iii.6.13; Bampur—

sherds with caprids and wavy applied bands in 1937, pl. VII, cf. Kulli *passim*.) Since the Kulli pottery with the closest affinities to scarlet ware does not show Harappa motifs the critical Early Dynastic contact must have taken place before Harappa traits were being manifested in South Baluchistan.

The Shahi-tump cemetery has pottery which stands nearest, at a superficial reckoning, to the early buff wares of Susa I. Closer examination reveals the flaccid, sloppy, brushwork, the misunderstood motifs and the introduction of designs unknown in the early wares which all indicate the derivative nature of the ware and agree with the independent evidence from stratification and associated objects for a late date. The best parallel is indeed the Khurab Cemetery and adjacent sites just over the Persian border mentioned above as containing evidence of a date not earlier than Early Dynastic and probably later still. The shaft-hole axe from Shahi-tump, derived from Early Dynastic forms, is paralleled by Akkadian types and best by one of the axes from Maikop in South Russia (Childe 1936), while the copper stamp seals have parallels in Anau III, Hissar III and with a probable analogue in a post-Akkadian context at Susa (Piggot 1943). The Shahi-tump cemetery should therefore be not earlier than Akkadian in date.

The Jhukar culture again has a shaft-hole axe of derivative Early Dynastic types, the roll-headed pins (Mackay 1943, 195) are of a type which goes back to Jemdet Nasr times in Iraq, occurs in Early Dynastic III and first makes its appearance at Hissar in IIIB (McCown 1942, Table I); another pin type is said by Mackay to occur in Sialk IV (1943, p. 198) and a biconical bead with ring-and-dot ornament (Majumdar 1934, pl. XXXII, 23) is paralleled at Hissar IIIC (Schmidt 1937, pl. LXX, H2788) and Anau III (Pumpelly 1908, Fig. 320). The seals (Mackay 1943, pls. XLIX and L) include two comparable with Anau III with curved quartering (Pumpelly 1908, Fig. 258) and as a group constitute a remarkable series of stamp seals owing nothing to Harappa forms but having affinities to seals from North Persia and even Hittite types in Anatolia (cf. Herzfeld 1933, Hogarth 1920, *passim*), the double-sided 'bulla' being an especially distinctive form common to Jhukar and the Hittite series. Jhukar therefore seems to equate with Hissar III and Anau III and should be Akkadian or later. The difficulties of reconciling this date, and that suggested for Shahi-tump above, with McCown's dates for Hissar III and Anau III have already been indicated.

CONCLUSIONS

As there are no external contacts discernible for the Jhangar culture we are in a position to review our total evidence and to justify the chronological table which represents the tentative result of the whole enquiry. In this table I have given the sequences of Iraq, Susa, Sialk, Giyan, Hissar and Anau as correlated by McCown, and have added the Indian evidence in five additional columns—the Quetta-Amri-Nal group of buff wares, the Zhob culture, Kulli and Shahi-tump, Chanhu-daro, and finally Harappa and Mohenjo-daro. The duration of Quetta ware is quite uncertain, but we have seen that the main stylistic analogues imply an Ubaid-Uruk horizon. I have been unable to bring Amri to a much earlier date than Jemdet Nasr since it is found immediately below Harappa deposits which cannot themselves be earlier than Early Dynastic, and it must persist to overlap with the Nundara phase of the Nal culture which is parallel to Kulli, again Early Dynastic. Nal is therefore forced into a post-Akkadian horizon in its mature phase.

The Zhob culture must overlap with Hissar I in its early (Sur Jangal) stage, and this should be not too remote from the beginnings of Amri. The lower limit of the Zhob culture is unknown, but sites such as Dabar Kot (Stein 1929, p. 55) imply survival of some form of red ware culture until Harappa times.

Kulli has firm chronological contacts with Early Dynastic I in its 'scarlet ware' analogues, and again with Early Dynastic III in the carved steatite boxes. It must overlap with Nundara and with Harappa but there may be a gap between its end and the Shahi-tump cemetery, which equates with Jhukar and Anau III—Hissar III and is definitely post-Harappa. I have already pointed out the difficulties inherent in accepting McCown's dating for Hissar II and III and Anau III, but, as an elaborate re-analysis of the material cannot be made here, I have incorporated his sequences for these sites in the table without any revision. There is therefore an incompatibility between the Hissar-Anau and the Harappa chronology as shown in the table, but this must remain unresolved at present. The Jhukar and Shahi-tump cultures, which appear to me to equate with Anau III and Hissar III, have likewise been placed in a chronological position discordant with McCown's sequence for the north-western sites. With these important reservations, the table gives at least a summary of probabilities for the position of the Indian cultures.

As a postscript it may be allowable to stray for a moment from the narrow path of pure chronology to the question of the relationship of the Indian cultures one to another from the view-point of origins. The Zhob culture takes its place as an easterly representative of the north Iranian red ware group of cultures, and Quetta ware seems the earliest of the easterly cultures of the buff ware group. Amri ware may derive from this or an analogous ceramic perhaps under red ware (Sur Jangal) influence and certainly seems to be ancestral to the Nal culture via the Nundara phase. The Kulli and Harappa cultures stand alone by reason of their direct contacts with Elam and Sumer, presumably by sea routes, and the strong stylistic links between Kulli ware and 'scarlet ware' and allied ceramics in Elam tempt one to suggest that the Kulli culture is in its essentials an intrusive culture established in South Baluchistan in Early Dynastic times or a little earlier and having its origin, and its subsequent mercantile contacts, with Khuzistan and the head of the Persian Gulf. If this culture provided, as it seems to have done, the first direct trade-connections between India and Sumer, the subsequent Harappa contacts of Akkadian times seem likely to have been made through Kulli middle-men, with the Harappa site of Suktagendor (Stein 1931, p. 60) as a fortified trading post on the Makran coast. And further we are forced to consider the origin of the Harappa culture itself, which appears in the Indus Valley with all the essential ideas of Early Dynastic Sumer, such as civic organization, writing, sculpture, seals, large-scale metal-working, etc., but with none of the points of detailed similarity. Are the intruding Kulli folk to be considered as a parallel phenomenon to the appearance of new ideas in Sumer in late Uruk times, ideas which included the art of writing and laid the foundations of the Early Dynastic culture? Were the old painted-pottery cultures revolutionized in India as they were in Sumer and Elam, and does Kulli stand in some way ancestral to Harappa, with the examples of Harappa 'influence' in South Baluchistan better to be explained as transitional types? It is well to remember that the true origins of the Harappa culture are still unknown, that its appearance in the Indian culture-sequence marks precisely the same step forward as the establishment of the Early Dynastic period in Sumer and that, alone of the lesser barbaric cultures identified in north-western India, Kulli had direct contact with the centres of higher civilization.

A final word on the Jhukar culture and its contemporaries. We have noted a number of correspondences in such things as copper tools, beads and other personal and portable objects between Jhukar, Shahi-tump, the last phase at Mohenjo-daro, Anau III and Hissar III where (except partially in Hissar and Anau) the pottery types were quite dissimilar. I think we should probably be justified in considering these analogous objects as manifestations of a fairly homogeneous semi-nomadic culture which was accustomed when settling down to adopt the pottery of the local people, and to regard all these sites as representatives of a diffuse movement of peoples eastwards in the first half of the second millennium B.C. But whether the authors of the culture spoke Indo-European dialects is another question.

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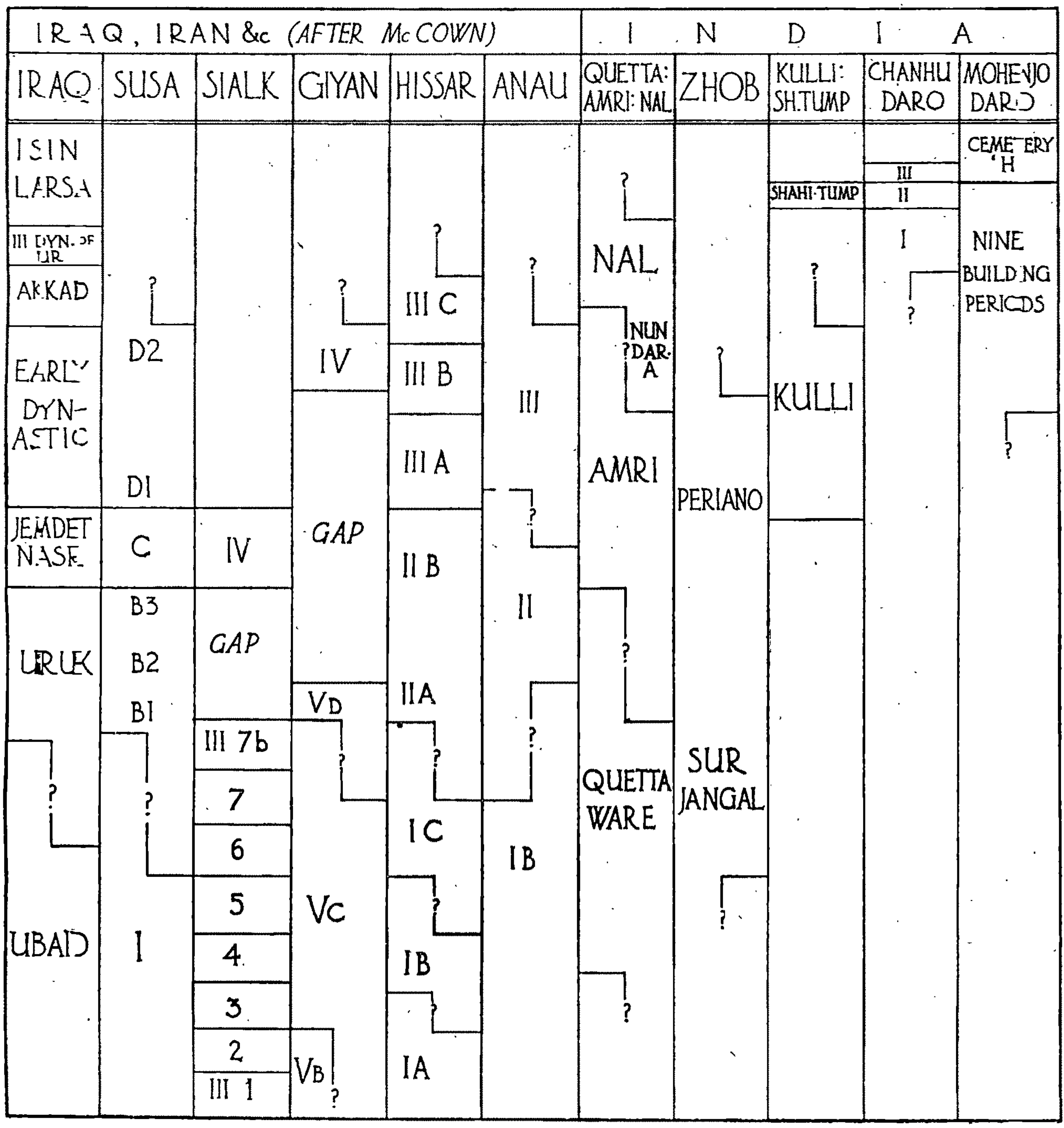

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A NEW HOARD FROM TAXILA (BHIR MOUND)

By G. M. Young

The discovery in 1924 of a hoard of coins and jewellery of about 300 B.C. in the earliest of the three cities of Taxila (the Bhir Mound), one of the principal cities of north-western India at the beginning of the historical period, was the first decisive evidence of date unearthed there. Recently, in 1945, a somewhat similar hoard has been found on the same site and at the same level. It includes elements of local origin together with two remarkably fine gems in a style derived from western Asia and illustrating the mixed origin of the cultural elements in the Indian frontier region at this time. The new hoard is here described by the Director of the British School at Athens, who was at Taxila at the time of the discovery.

MOST of the objects discussed in this article were contained in a deposit of coins and jewellery brought to light during the excavations by the Archaeological Survey of India in the Bhir Mound at Taxila, Punjab, in January and February, 1945. The deposit, evidently the property of a jeweller, consisted of eighteen bent-bar silver coins, some gold and silver jewellery, two Ionian Greek gems, an amethyst bead and a rock-crystal bead. With these have been included for description a third Ionian Greek gem found in another part of the same excavations: five miscellaneous bent-bar silver coins (pl. VIA), three bent-bar copper coins (Appendix, Part III) and a number of single-type coins (Appendix, Part VI) bearing similar impresses, all discovered in the Bhir Mound at different times: and finally, two bent-bar silver coins from the collection of Mr. Cuthbert King, who has kindly allowed me to publish them (pl. VIA).

1. The bent-bar coins

Thirty-three coins of this type formed part of a hoard discovered in the Bhir Mound in 1924 and published by Walsh from photographs in 1939.[1] This hoard was lying at precisely the same depth as the deposit of 1945, and is dated by a fresh coin of Philip Aridaeus to about 317 B.C. Including the five specimens unearthed at different times between 1920 and 1937, the Bhir Mound has thus produced fifty-six of these coins. There are nine bent-bar silver coins in the British Museum[2]; three of these were acquired by Whitehead in Rawalpindi, and four from the Stubbs collection are presumed to have come from N.W. India. There are nine bent-bar silver coins also in the Indian Museum.[3] Owing to war-conditions these are not available for study at the time of writing. The hoard found in the territory of Bajaur (which lies between the Chitral and Swat rivers) in 1942 is said to have included two separate deposits, one of which consisted entirely of punch-marked coins. Most of these were of the usual type, but there was a considerable number of bar coins also. According to report, a large proportion of this deposit was virtually in mint condition.[4] A photograph of six bar coins from this hoard shows five of them bearing versions of the Taxila mark as a countermark. All six are of the Bhir Mound type.[5] Mr. King's two specimens acquired recently in Rawalpindi are alleged to have come from Charsadda, but are remarkably like the coins from Bajaur. One of them bears what appears to be the Taxila mark, partially obliterated by a later countermark. A feature of General Haughton's and Mr. King's coins is their excellent state of preservation. In spite of their numerous countermarks they seem to have had little if any common circulation.

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[1] *Memoirs of the Archaeological Survey of India* (Delhi, 1939), No. 59, pp. 1, 3, 100, Pl. IV.

[2] J. Allan, *Coins of Ancient India* (B.M. Catalogue, 1936), pp. xvi, 1, 2, Pl. I.

[3] *Indian Museum Catalogue* (1906), p. 136, and *Supplementary Catalogue* (1923), p. 8.

[4] See Major-General H. L. Haughton's note in the *Journal of the Numismatic Society of India*, IV, part I, p. 61.

The eighteen coins of the present find (pl. V) also show few traces of wear. They are, however, more corroded than those found in 1924. This is not surprising, as they were found lying in the ground, whereas the coins of 1924 were in an earthenware jar. It is for this reason, no doubt, that their average weight after cleaning is 166 grains only, as compared with 175·6 grains, the average weight of the 1924 coins.

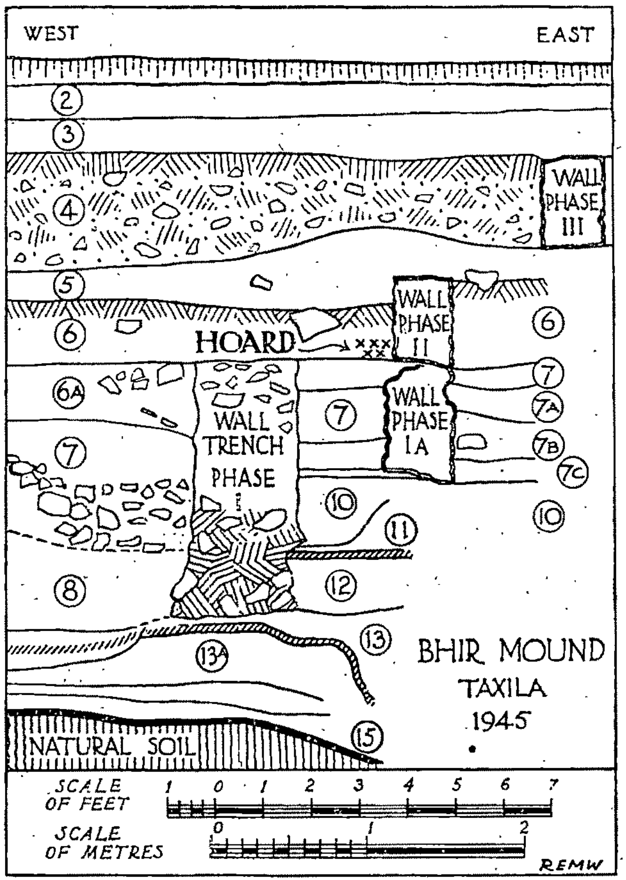

FIG. 1. *Section indicating the stratigraphical position of the 1945 hoard.*

The metrology of bent-bar silver coins is discussed by Walsh.[6] Allan, referring to the specimens in the British Museum, had suggested that coins of this type were struck on a Persian Standard, and represent double sigloi or staters.[7] Walsh points out that there is evidence for ancient Indian coins of a similar weight, namely 100 *ratis* or 180 grains, and that the standard need not therefore necessarily be Persian. Whatever the origin of the

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[5] General Haughton, to whom the coins belong, has kindly permitted me to refer to them.

[6] Op. cit., pp. 2, 3.

[7] Op. cit., p. xvi.

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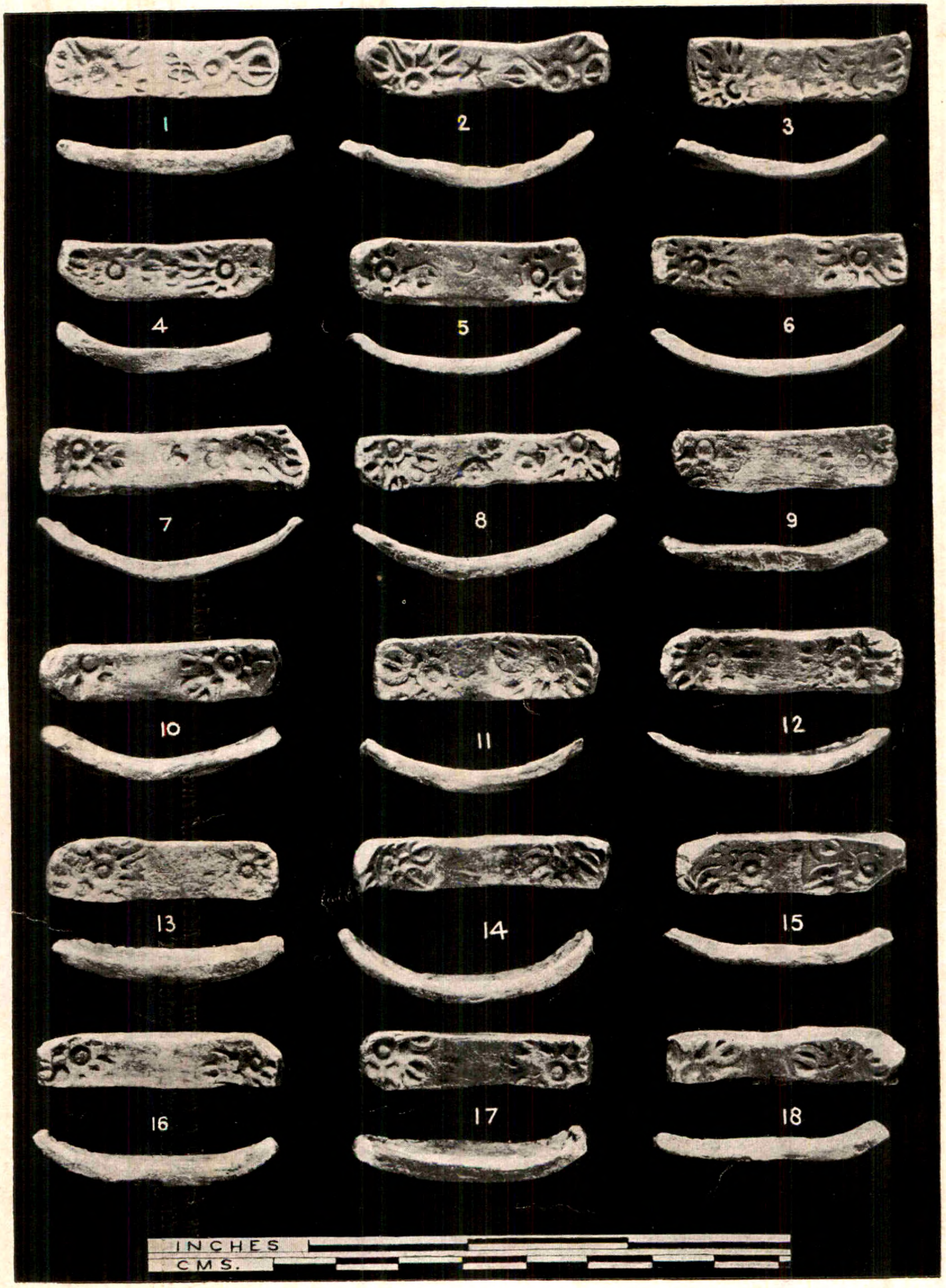
PLATE V



Taxila (*Bhir Mound*)*: silver bent-bar coins from the* 1945 *hoard.*

PLATE VI

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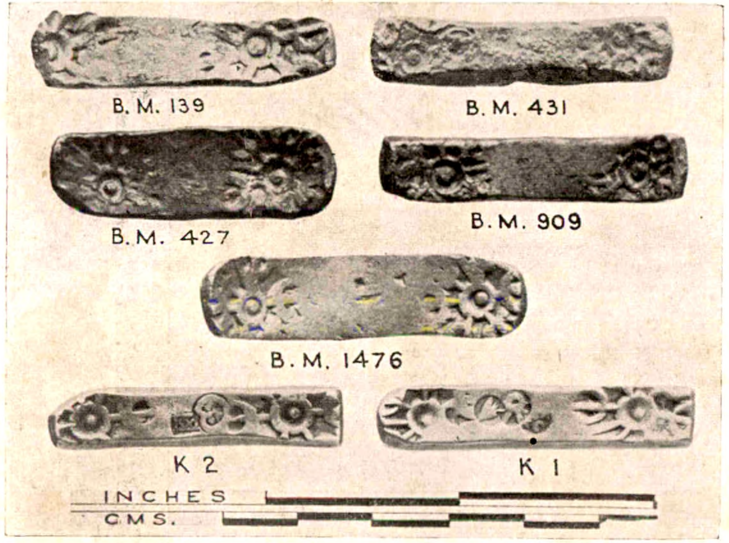
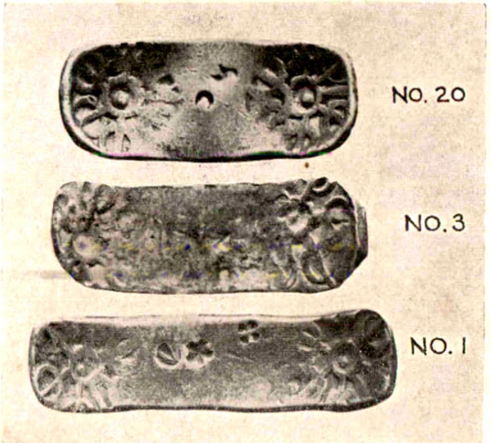
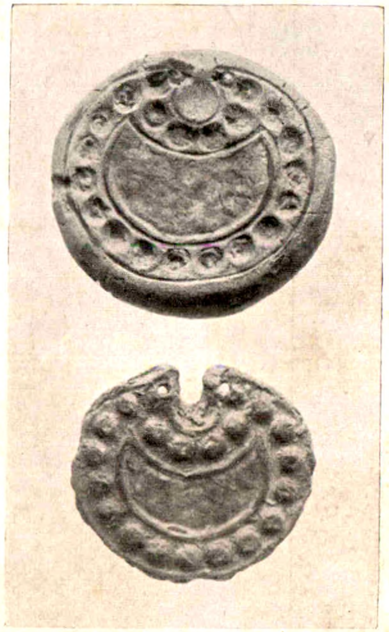


A. *Five miscellaneous bent-bar coins from Bhir Mound, and two (K 1-2) from Mr. King's collection.* Scale 1 : 1



B. *Bhir Mound: part of* 1924 *hoard.* Scale 1 : 1



C. *Terracotta mould and pendant from Bhir Mound.* Scale 1 : 1

standard, it is clear that all the known bent-bar silver coins belong to it. The British and Indian Museum coins, however, are shorter than those from the Bhir Mound, and differ in certain other particulars to which reference will be made later. For the moment I propose to consider only those coins which I have been able to examine personally, i.e. those from the Bhir Mound and Mr. King's two specimens.

These coins consist of thickish silver bars ranging from about 1·2 inches to about 1·7 inches in length, and averaging about ·4 inch in width. They are all bent or curved to a degree varying directly with their length and inversely with their thickness. Experiment has shown that the curvature is due to their having been struck while hot on a wooden anvil. They bear on the obverse or concave side a common symbol which varies in minute details only, and is impressed twice, once at each end of the bar (to prevent shortening). The faces of the dies were circular and convex, thus producing a concave incuse and accentuating the curvature at the ends of the coins. The dies were mainly of three sizes, the largest ·8 inch in diameter, the next, and commonest, rather under ·7 inch, and the smallest ·6 inch. With one exception the dies are substantially wider than the bars on which they are impressed, so that the complete impress is never seen. The exception is No. 20 of the 1924 hoard, which will be considered later. The bars appear to be strips cut from oblong ingots. The width of the ingot determined the length of the coin, the thickness remained the same and the strip was therefore cut to a width which, combined with the other two dimensions, would give approximately the weight required. After being cut, the bar was adjusted more exactly to the correct weight by chiselling at the corners and along the obverse sides. The latter process was carried out very neatly in some coins and somewhat roughly in others. The effect in either case was to reduce still further the width of the surface presented to the die. A few coins that seem to broaden uniformly towards one end, e.g. No. 2 of 1924 [8] and No. 3 of 1945 [9] may represent the last piece from an ingot.

Several coins bear countermarks punched on the obverse, between the two impresses of the symbol if there is room, or over them if there is not. For the nature of these countermarks see Walsh.[10] The countermarks on the coins now published are shown in Part V of the Appendix to this article. The reverse of these and all other bent-bar coins is blank.

The obverse symbol (Appendix, Part V) is a circular design in relief composed of six tridents radiating from a central ring. It is obviously akin to the six-armed symbol of punch-marked coins. The outer prongs of the tridents curve inwards in semicircles until their tips touch or nearly touch the upright middle prong, at or just before the point where it reaches the rim of the incuse. All the coins of which we are speaking have a pellet in the central ring and a straight line extending, like the six arms, from that ring to the outer edge. Walsh conjectures that this straight line represents a pole for carrying the emblem as a standard.[11] Most, and probably all, of the impresses contained in addition a pellet between two of the tridents. If we think of the emblem as the dial of a clock, with the pole standing at six and the tridents at the odd hours, this pellet will be found either on the left, at ten, or on the right, at two.

These details are often hard to verify owing partly to corrosion or wear, more to uneven stamping, and most of all to the narrow width of the bars. The pole can usually be made out, as it takes off from the central ring. If the outer edge of the ring is complete, one has merely to count seven lines radiating from it. There are only three coins in which the pole does not actually appear. These are Nos. 4 and 5 of the 1924 hoard, and No. 18 of the present find. The pellets are more difficult. Of the two possible pellet points, only one is likely to be on the coin, and sometimes both are missing. The duplication of the symbol on each coin gives less help than one might expect as the two impresses,

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[8] Walsh, op. cit., pl. IV.

[9] Pl. V.

[10] Op. cit., p. 2, pl. III.

[11] Op. cit., p. 2.

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stamped no doubt in quick succession, are generally more or less in line, so that if the pellet misses the coin laterally in one impress it will probably miss it in the other also. Pellets can be seen on twenty-nine coins. They can be inferred, by comparison, in the impresses on twenty-four more. This leaves five coins, Nos. 4, 11, 22, 25 and 26 of the 1924 hoard, which contain no evidence of a pellet. Equally, they contain no positive evidence against one.

An analysis of the impresses is given in Part IV of the Appendix. Seven dies are represented on two or more coins each, and twelve dies on one coin each. The dies can be classified in the first instance according to their sizes in conjunction with the position of the pellet. But there are other small variants to be noticed. A few coins, which appear to be oldest, have the pellet closer in towards the central ring than the rest. These are No. 3 of 1924 in the ·8 inch class, with pellet l.: No. 1476 in the ·68 inch class, with pellet l.: and No. 20 of 1924 in the ·6 inch class with pellet r. (pl. VI, A and B). No. 20 alone among Bhir Mound coins has the prongs of its tridents open, like the short bar coins in the British Museum.[12] The ·6 inch class, with 11 coins, is the smallest, and the only one with a high proportion of pellet l. It also includes most of the older-looking coins. The ·68 inch class, with thirty coins, is the largest. Only five coins in it have the pellet l. Among those with pellet r., three separate dies can be distinguished. One, marked *d* in Appendix IV, with thirteen coins, has no distinctive features. Another, marked *e*, with ten coins, has the pole leaning at a tangent against the trident on its right: while a single coin, No. 12 of 1925, has the pole leaning similarly against the trident on its left. The same feature appears in an older coin, No. 1476, with pellet l. The ·8 inch class, with sixteen coins, contains only three with pellet l. Of those with pellet r., twelve have a common die with no peculiar features, leaving one, No. 10, by itself. This coin shows the pellet in both impresses. The base of the pole, which can just be seen in one impress only, lies two-thirds of the way from the base of the trident on its left to that of the trident on its right. The pole in this die, therefore, probably touches the trident, like those in the ·68 inch class. We may notice there that the short bent-bar coins in the British Museum have either a pole, or a pellet, or neither, but not both.[13] The long bar coins have both. No. 26 of the 1924 hoard, which shows the pole only, and is as short as the longer of the British Museum coins, might at first sight seem to belong to that class. But there is a wide space between the second and third trident to the right of the pole. There can be little doubt that the pellet would be there if the impress were complete, and that the shortness of this coin is accidental.

The above details would not be easy to recognize, even when visible, on coins in circulation. Their purpose, if any, must have been to distinguish the dies themselves. They may have been useful in maintaining a check on issues. If so, it seems odd that the coiners should ignore the three other positions available for the pellet, but perhaps there was a symbolical reason for sticking to the two equidistant points.

We have still to account for the persistent use of broad circular dies on pieces that are mostly narrow and rectangular. The Whitehead short bar coins in the British Museum[14] are an exception. They are suitably shaped and broad enough to carry the circular impresses stamped upon them. Among the long bar coins there is only one that answers to this description, No. 20 of the 1924 find (pl. VIB). This coin which, as we have already seen, appears to be one of the oldest from the Bhir Mound, is also the only one with open tridents, which are a characteristic of the short bar coins. Its width as given in the measurements supplied to Walsh is ·55 inch, but I make it just over ·6 inch. It carries a ·6 inch impress which exactly coincides with its shape. It is in fact a model of its class. No other Bhir Mound coin is equally well proportioned and finished. Thus No. 3 of the 1924 hoard

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[12] Allan, op. cit., pp. 1, 2.

[13] Ibid.

[14] Allan, op. cit., pl. I, 1, 2.

(pl. VIB), which also is an older coin, has a width of ·5 inch, but is stamped unsymmetrically with a ·8 inch die. The other older coins are not more than ·45 inch wide. The less worn coins, which form the great majority, are rarely more than ·4 inch wide, and sometimes considerably less. They are all very much narrower than their dies. An extreme case is No. 5 of the 1924 hoard, which has an obverse surface varying from ·2 to ·3 inch, and an impress of ·8 inch diameter.

We may conjecture therefore that bar coins were originally intended to be of uniform width and to carry circular impresses of a like diameter. The Whitehead coins and No. 24 of the 1924 hoard are examples of this intention, which began, however, to be abandoned even in the older types, owing presumably to the difficulty of obtaining ingots of the right shape. In the later types, all relation between the dimensions of coin and die have disappeared.

We may turn now to the question of date. The recent find includes coins of the later type only. As far as I can judge, these are on the whole neither more nor less worn than the corresponding coins in the find of 1924. This suggests that the two finds are roughly contemporary, a conclusion which is acceptable also on other grounds. The former find is already dated to about 317 B.C. The fact that there are several older coins in the find of 1924 and none in that of 1945 presents no difficulty. The one was a genuine hoard of over 1100 silver coins laid up in a jar together with a few ornaments. The other (to anticipate a little) was part of the contents of a jeweller's workshop, including an amount of cash which might represent no more than a single purchase.

Allan suggests[15] that the present of 80 talents of stamped silver which, according to Curtius, was made by Omphis, King of Taxila, to Alexander in 326 B.C. may have consisted of bar coins. Assuming that Curtius's story is founded on fact, the evidence of the Bhir Mound coins supports this suggestion. The high proportion of relatively little-used pieces would be consistent with a period of exceptional activity in the Taxila mint a few years before. Arrian mentions a present of 200 talents of silver, but does not say that it was coined. According to Plutarch, it was Alexander who gave 1000 talents in coined money to Omphis.

The Bhir Mound has produced also three bent-bar copper coins and about twenty round or square coins which resemble the silver bar coins in bearing versions of the same symbol, impressed with a convex die. For completeness, particulars of these coins have been added in Parts III and VI of the Appendix. The copper bar coins, as I have already noted, are short-bar coins akin to the silver coins in the British Museum.

The round or square coins, several of which are in poor condition, may be compared with the similar coins in the British Museum.[16] Two silver coins, Nos. 450 and 747m, weigh only about 7 grains each. Both of these are beautifully finished. The former is unique among concave pieces in being stamped with the ordinary six-armed symbol of punch-marked coins. It is worth noting that the 1924 hoard, in which bent-bar coins were found together with 1055 flat punch-marked coins, did not contain any of these concave single coins: nor, if reports are correct, did the Bajaur hoard, in which there were at least 500 flat punch-marked coins together with an unascertained number of bar coins.

As for the bar coins themselves, there is no evidence that they continued beyond the fourth century. The hoard unearthed in another part of the Bhir Mound in 1912, and dated by a coin of Diodotos to about 248 B.C., contained none of them. There is no hint of their existence in Mauryan Taxila, still less in the succeeding Indo-Greek period. In the absence of further information it may be conjectured that they came to an end with the dynasty of Omphis, in the confused period which accompanied the rise of Chandragupta to power in North-West India.

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[15] Op. cit., p. xvii.

[16] Allan, op. cit., pp. 2, 3; Pl. I, 4, 5.

2. THE GOLD ORNAMENTS

(1) Eighty-four round beads, ribbed and collared, 12 to 14 ribs. Length ·23 inch. Total weight 177 grains. Eighty-one beads shown in pl. VII.

A number of similar ribbed beads, with very ornate spacers, formed part of the Bhir Mound hoard found in 1924 and are shown in pl. VIII.

(2) Three conical terminals with grooved decoration. Total weight, 14 grains.

Two of these, measuring ·55 × ·3 inch, have three openings at the broad end suitable for receiving three strings of beads of the above size. The third, measuring ·55 × ·4 inch, has two openings and is large enough for two rows of the beads next following. This terminal is shown in pl. VII as intended for the back of the neck, where, however, it would be awkward to handle, and incidentally concealed by the hair. It seems more likely that it was one of a pair of terminals for the beads next following.

(3) Sixty round beads, also ribbed and collared, 8 to 10 ribs. Length ·35 inch. Total weight 170 grains. Forty-nine shown in pl. VII (outermost string).

These beads appear in the plate with the smaller beads, but belong to another necklace. The ribs are not the result of simple grooving, but are prominent and angular in outline, recalling the flanges in the fruit of the *amla* which was afterwards so frequent a motive in Hindu architecture. The fact that the tree is not indigenous in the Northern Punjab, is

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PLATE VII

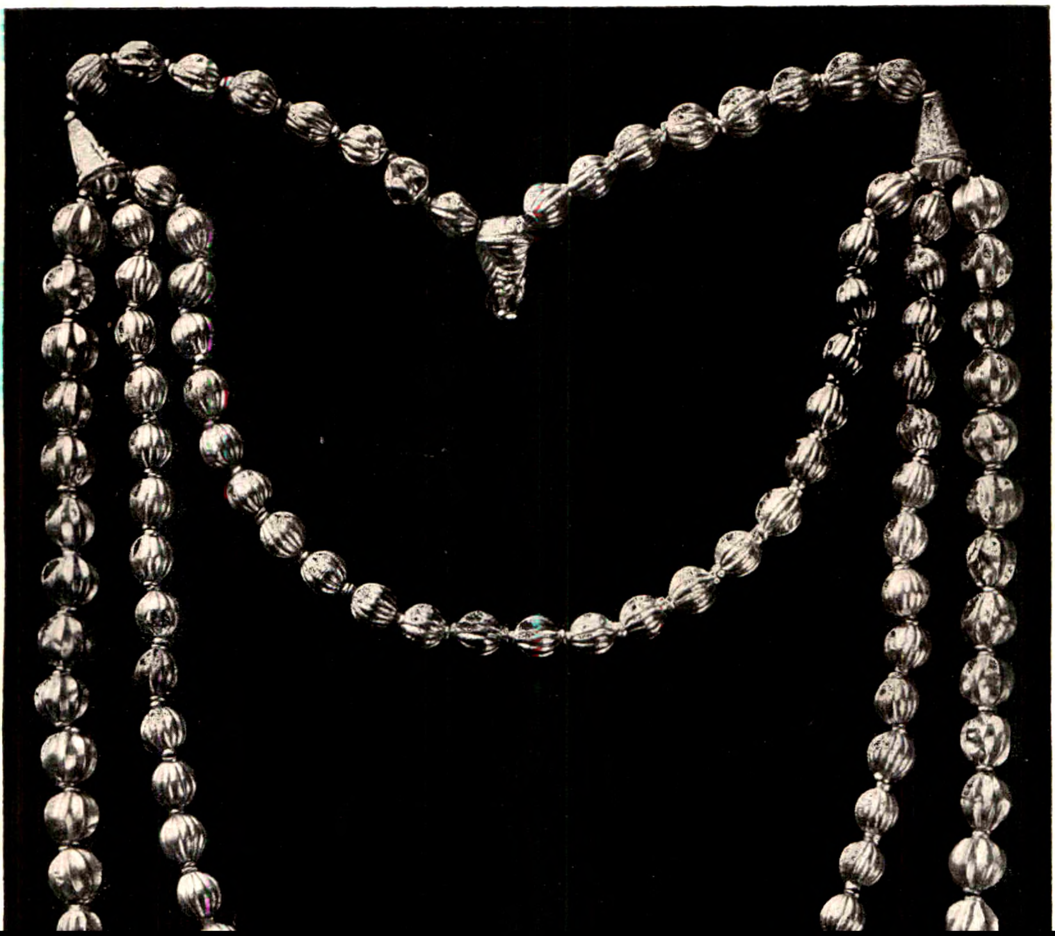

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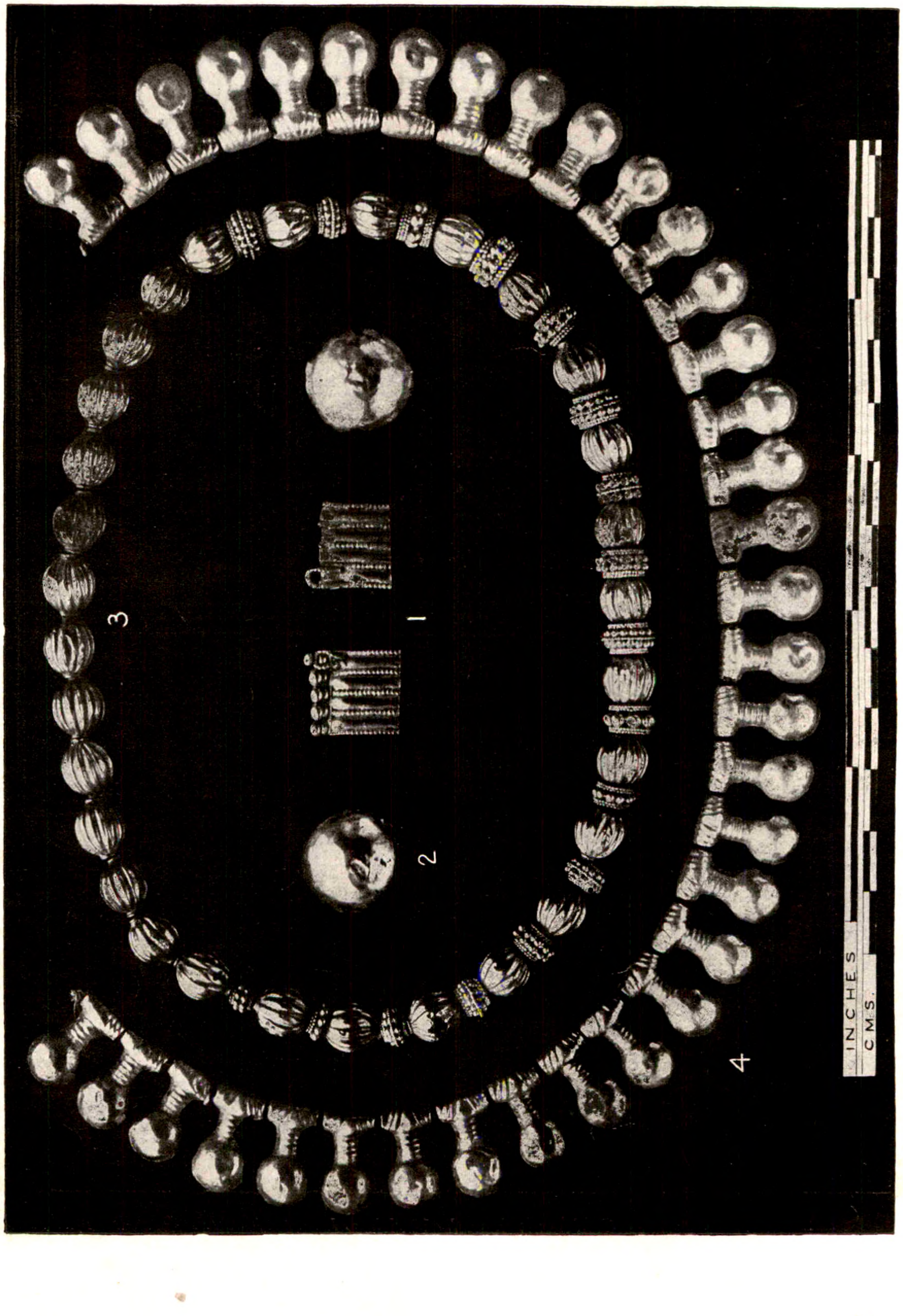
PLATE VIII

To face page 33



Ornaments from the 1924 hoard: 1–3, gold; 4, silver.

bands and other ornaments which seem to be studded with similar bosses in a manner recalling, on a larger scale, the decoration of No. (5) above. A single boss of identically the same pattern was found in a house in the Bhir Mound in 1921. Two bosses without rims were found in the 1924 hoard and are shown in pl. VIII, 2.

3. THE SILVER ORNAMENTS

(1) Eleven bell-shaped pendants, ·5×·8 inch. Pl. XA, 1–8, 10, 12-13.

(2) Five tubular spacer-beads, four measuring ·75×·25 inch, with spiral decoration, and one measuring ·9×·26 inch, with bead and reel. Pl. XA, 14, 16, 18, 20, 22.

The above go together.

(3) Six finger-rings with plain oval convex bezels. Pl. XA, 9, 11, 15, 17, 19, 21.

These rather second-rate ornaments are not without interest. In the first place the decoration of the spacer-beads is purely Greek. Secondly, the presence of no fewer than six cheap silver rings confirms a suspicion, already aroused by the gold ornaments, that we have here not a private hoard, but the contents of a jeweller's shop.

Bell-shaped pendants occur in a silver girdle of the archaic period from Cyprus in the British Museum (No. 1576, Catalogue, pp. 162-3, pl. XXVI).

4. THE GEMS

(1) (*a*) Irregular pear-shaped scaraboid. Banded agate. Pierced. ·9×·65×·55 inch. Lion to l.; tearing stag to l. Pl. XB, 1.

(*b*) Square table-cut gem. Banded agate. Pierced. ·7×·7×·3 inch. Lion to r.; tearing stag to r. Pl. XB, 3.

Ionian Greek work of the fourth century B.C. The two stones were lying in the ground close together. The scaraboid, which was found first, presented something of a problem, as it is unfinished. In particular, the drilling of the lion's claws on the flank of the stag has only just been begun and the engraved surface is unpolished. The problem was solved by the discovery nearby of a second, and completed, gem of the same material, with the same subject, and evidently by the same hand. Furtwaengler's *Antike Gemmen* includes three Ionian Greek gems engraved with very similar versions of this favourite theme. One in Berlin[18] is from Athens, another is of unknown provenance,[19] and a third in Paris[20] is said to have come from the East. All these show the animals to left, as in the Taxila scaraboid, but in the third, the stag's head is turned round, almost in profile, to right. The second shows the lion's hind paw planted against the stag, as in the square gem. The best example of this pose occurs, however, in a well-known fifth-century gem from Athens in the British Museum,[21] with lion and stag to right.

In both the Taxila gems the engraver has evaded a difficult perspective, not very skilfully, by showing the lion's head and jaws in profile above the stag, instead of turning them to the front and enabling the jaws to close on the stag's neck or withers. He has also omitted the usual stylized rendering of the lion's thigh-muscles, and added a string of heraldic dots along the inner sides of its hind legs.

The gems might have been ascribed to the first half of the fourth century or even the end of the fifth, if the evidence of the coins, combined with the fact of one gem being unfinished did not point conclusively to the last quarter of the fourth. That this Greek craftsman, at work in distant Taxila, should be following a style and tradition current in the Mediterranean two or three generations earlier is exactly what we should expect. A similar trace of archaism may be detected in his silver spacers and the smaller of his gold ribbed beads. The full result of the excavations will possibly throw more light on the circumstances which brought him to India, and help to explain the suddenness with which his activities apparently came to an end.

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[18] Furtwaengler, *Antike Gemmen*, pl. XI, 22.

[19] *Ibid.*, pl. XXXI, 5.

[20] *Ibid.*, Vol. III, p. 447, fig. 229.

[21] B.M. No. 125. Furtwaengler, pl. XIII, 36.

(2) Scaraboid. Green jasper. Pierced. ·75×·65×·4 inch. Stag galloping to l. Pl. XB, 2.

This lively if not very finely carved gem comes from another part of the excavation, and was found at a depth of 9 feet. Like the others, it is the work of an Ionian Greek, but the subject and its treatment with the forelegs 'flat out' are Persian. The depth and stratum at which it was found indicates an earlier date than the hoard, probably not later than the middle of the fourth century B.C. and possibly somewhat earlier. The stone is a true scaraboid, that is, a regular oval, with rounded back and steep, almost vertical sides.

(3) Hexagonal barrel bead. Amethyst. Length ·65 inch. Pl. IX, 4.

This beautiful stone is by far the finest amethyst hitherto found in the Bhir Mound. Pliny in his *Natural History* praises Indian amethysts above all others for their exquisite colour (XXXVII, 8).

(4) Square table-cut bead. Rock-crystal. Pierced. ·7×·7 inch. Pl. IX, 5.

This bead is of the same size and shape as the gem 1(*b*) above and was probably intended also for an intaglio.

APPENDIX

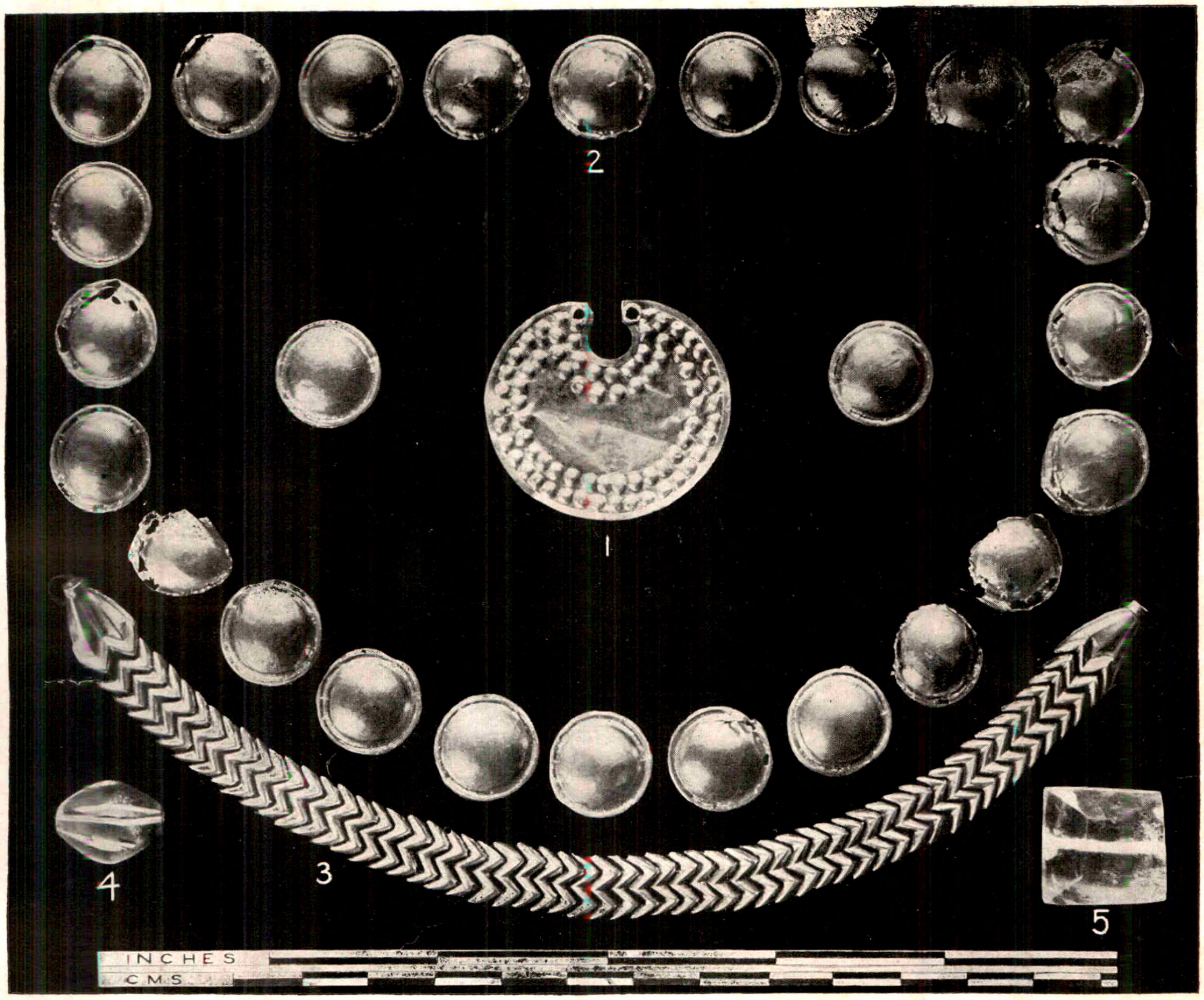
BENT-BAR COINS

I. Bhir Mound 1945 (silver)

No.	Weight in grains	Size in inches	Diameter of die	Countermarks (see Part V, below)
1	168	1·5×·4	·8	(1)
2	169·2	1·6×·37	·68	(2)
3	155·9	1·38×·45	·68	(3)
4	166	1·45×·4	·68	(4)
5	171·3	1·5×·4	·68	(5)
6	166·5	1·6×·4	·68	(6)
7	161·1	1·7×·4	·8	(7)
8	164·3	1·7×·4	·68	(8) (9) (10)
9	158·9	1·4×·4	·6	None
10	162	1·5×·4	·68	,,
11	167·4	1·45×·45	·8	,,
12	166·3	1·5×·4	·68	,,
13	163·6	1·45×·4	·68	,,
14	169·3	1·6×·36	·68	,,
15	169·9	1·45×·4	·8	,,
16	164·1	1·55×·4	·68	,,
17	171·4	1·5×·4	·68	,,
18	172·1	1·5×·4	·68	,,

II. From Mr. King's collection (silver)

K. 1	160	1·65×·35	·68	(13) (14) (15)
K. 2	166·9	1·5×·3	·8	(16) (17)



1–3, *gold ornaments;* 4, *amethyst bead;* 5, *crystal bead. All from the* 1945 *hoard.*

PLATE X

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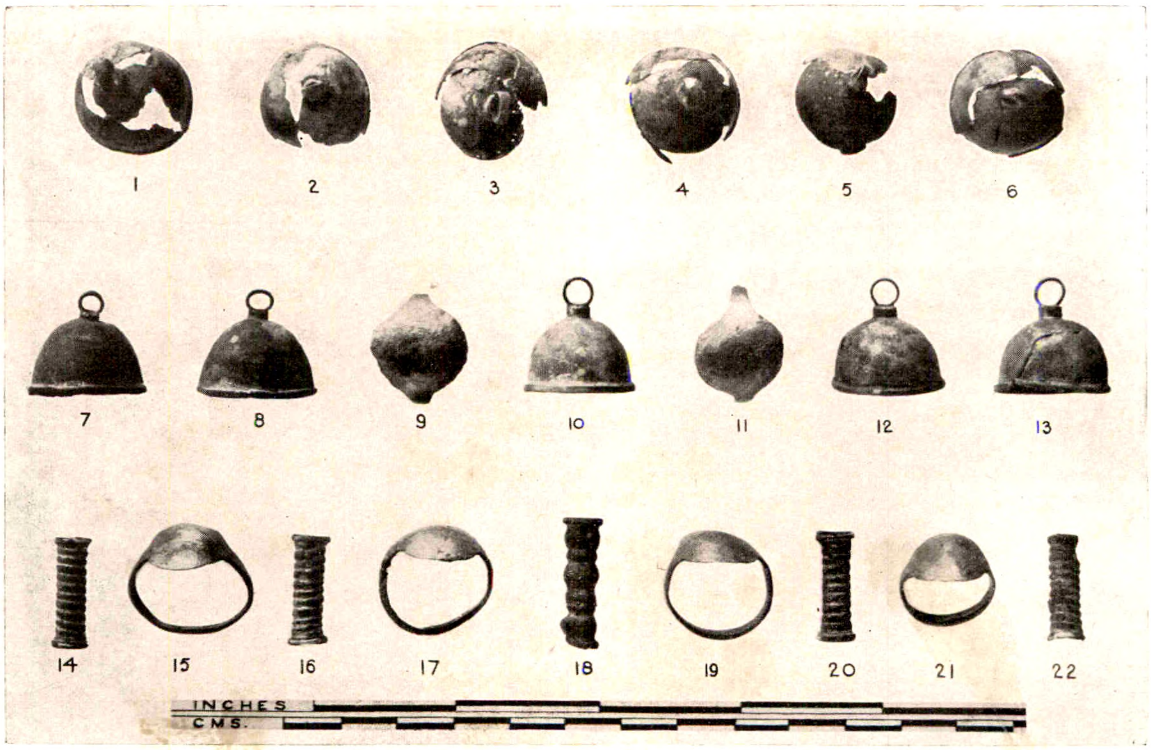
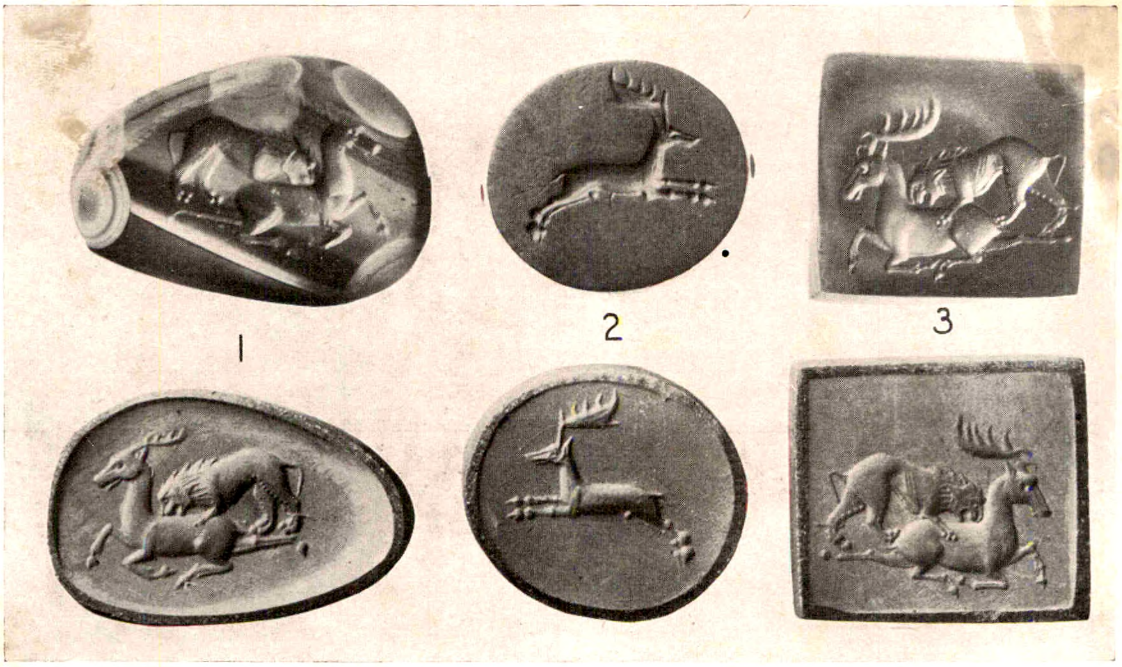


A. *Silver ornaments from the* 1945 *hoard.*



B. 1 *and* 3, *gems from the* 1945 *hoard*; 2, *gem found elsewhere in the Bhir Mound*, 1945. Scale 2 : 1

III. Miscellaneous bent-bar coins from Bhir Mound

Museum number and metal	Date of find	Weight in grains	Size in inches	Diameter of die	Countermarks (Part V, below)
B.M. 437 AR	13-3-20	153·5	1·45×·5	·68	None
B.M. 139 AR	31-10-21	155	1·53×·4	·8	,,
B.M. 909 AR	22-11-21	163	1·55×·37	·68	,,
B.M. 1476 AR	28-11-21	158·2	1·65×·4	·68	(11) (12)
B.M. 431 AR	21-10-37	164·7	1·52×·4	·68	None
B.M. 1198 AE	3-4-20	161·6	1·15×·4	·8	,,
B.M. 933 AE	29-3-20	155·2	1×·45	·7	,,
B.M. 851 AE	22-4-21	132·6	1·1×·5	·8	,,

IV. Comparison of obverse symbols

Diameter of die in inches	Position of pellet	1924 hoard	1945 hoard	Miscellaneous
·8	l.	3, 28a	7a	
	r.	9b, 10, 17b	11b	
	not l.	8b, 12b, 23b, 31b	1b	B.M. 139b
	?	5b	15b	K 2b
·7	?	11		
·68	l.	21	17c	B.M. 1476
	not r.	—	3c	B.M. 909c
	r.	14d, 16e, 19e		
		27d, 32d	8e, 10e	B.M. 437d
			12, 13d	
			14d	
	not l.	2e, 15e, 18e, 24e	2d, 4d	
		26	6d	
	?	7e	5e, 16d, 18d	B.M. 431e, K. 1d
·6	l.	1f, 6g, 13f, 29g, 33g	9g	—
	not r.	22, 25	—	—
	r.	20, 30	—	—
	?	4	—	—

Small letters indicate groups from apparently identical dies.

V. Symbol and countermarks (enlarged to 2 diameters)

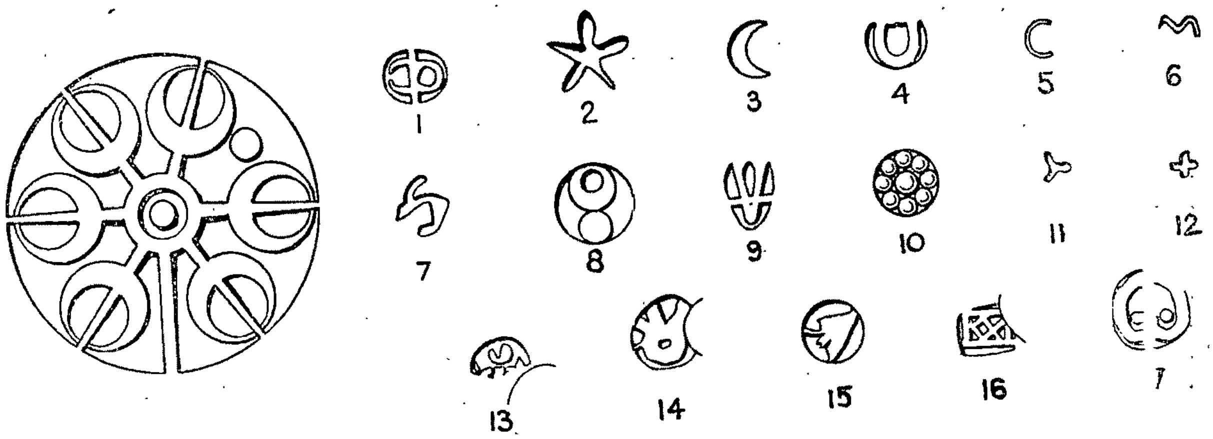


FIG. 2. *Obverse symbol with pellet r., and countermarks 1–17.* $\frac{2}{1}$ *(See Appendix, Parts I–II*)

Note: For countermark 5, cf. Nos. 4 and 33 of 1924 (the mark on No. 28 is a pellet in the symbol). For countermark 10, cf. No. 14 of 1924 (Walsh, op. cit., p. 100, pls. III and IV).

VI. Single-type round or square coins from Bhir Mound (all in Taxila Museum)

Museum No. and metal	Date of find	Weight in grains	Diameter in inches		Centre	Other details
			Coin	Die		
B.M. 241 Billon	8-11-24	33·8	·5	·6	Pellet	Pole. No pellet discernible.
„ 320 AR	22-12-30	35	·55	·65	? Blank	Indistinct.
„ 450 AR	12-3-20	6·9	·35	·3	Pellet	Ordinary 6 armed symbol. Coin circular.
„ 500 AE	5-3-37	18·1	·48	·43	Cross	Pellet. No pole.
„ 609 AE	14-3-37	41·2	·55	·7	? Blank	Pellet. Room for pole.
„ 639 Billon	17-11-21	33·4	·65	·6	Blank	Pole. No pellet discernible.
„ 747 AR	20-11-20	7·5	·32	·4	Cross	? Pole. No pellet. Coin square.
„ 926 Billon	29-1-31	18·8	·5	·6	Cross	Pellet. No pole.
„ 1013 AR	29-3-20	16·3	·5	·47	Pellet	No pole or pellet discernible.
„ 1098 AR	11-2-31	35·4	·55	·5	Pellet	Pellet. No pole discernible.
„ 1100 AR	30-11-20	19·2	·45	·48	Cross	Pole and pellet.
„ 1244 AR	2-12-20	63·6	·65	·5	Blank	No pole or pellet discernible (disturbed by countermark).
„ 1391 AE	4-12-20	34·3	·6	·7	Pellet	? Pole. No pellet discernible.
„ 1407 AE	1-4-20	41·7	·58	·58	Pellet	Pole. No pellet discernible.
„ 1481 AE	29-11-21	40·5	·6	·58	Indistinct	No pole or pellet discernible.
„ 1499 AE	3-4-20	13·7	·45	·48	Cross	Ditto.
„ 1700 AE	13-6-20	36·2	·6	·65	Indistinct	Indistinct.
„ IV925 AR	21-12-44	18·3	·55	·5	Cross	Pellet. No pole.

THE POTTERY OF AHICHCHHATRA, DISTRICT BAREILLY, U.P.

By A. GHOSH *and* K. C. PANIGRAHI

Pottery has been described as the alphabet of archaeology. Its study is a primary basis of modern archaeological science. Unlike metal objects, which travel easily and last indefinitely, pottery is short-lived and is liable to provide close evidence as to date and culture. Even pottery may on occasion travel extensively; for example, on a site near Pondicherry in French India are found, in addition to local products, wares made anciently as far away as Italy on the one hand and China on the other. Such contacts are of outstanding value as evidence for commerce and chronology. But a noteworthy need in Indian archaeology at the present time is the careful classification of local pottery-industries. Mr. K. C. Panigrahi has made a special study of the pottery of Ahichchhatra, and here tabulates his main results, with a historical introduction by the Superintendent in charge of the Excavations Branch of the Archaeological Survey of India. It remains to be seen how far this classification is valid in other parts of India.

INTRODUCTION

By A. GHOSH

THE kingdom of North Pāñchāla, of which Ahichchhatra[1] was the capital, was, according to the *Mahābhārata*, wrested from the king of Pāñchāla by the Kurus, who made it over to their preceptor Droṇa. The name of the capital, meaning 'the canopy of serpents', gave rise to many legends about kings or religious teachers having been protected here by serpents. The earliest inscription referring to this place, however, calls it Adhichchhatrā.[2]

In historical times the country of Pāñchāla attained prominence in the first century B.C. under rulers who are known from their coins and some inscriptions. Nothing is known about its history in the subsequent centuries. Some recently discovered seals, however, reveal that under the Guptas Ahichchhatra formed a division (*bhukti*) of the empire. In the seventh century it was visited by Hiuen Tsang, the Chinese pilgrim, who found here ten Buddhist monasteries and nine Brāhmaṇical temples. By the eleventh century Ahichchhatra ceased to be the capital of Pāñchāla, for an inscription refers to Vodāmayūtā (modern Badaun, U.P.) as the capital.[3]

The ruins of Ahichchhatra are situated about seven miles to the north of Aonla, a sub-divisional town in district Bareilly, and about half a mile to the north-east of the village of Rāmnagar which is even now known to the Jainas as Ahichchhatra. They consist of a brick fortification of the shape of a rough isosceles triangle with a perimeter of about three miles and a half, enclosing a series of rolling mounds, the highest of which, representing the site of a temple, stands to a height of 75 feet above the level of the cultivated fields

① brick fortification - perimeter 3 miles and a half.

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[1] The name is more commonly spelt Ahichchhatrā in ancient texts.

[2] Pabhosa inscription, *Epigraphia Indica*, II, 242.

[3] Badaun inscription, *ibid.*, I, 64.

outside. They were visited by Cunningham, who excavated, among other mounds one about two miles to the west of the city supposed to represent a *stūpa* of Aśoka.[1]

Later on Führer partially excavated a temple in the city with rather indifferent results.[2] In recent years (1940–44) the Archaeological Survey excavated at selected places within the fortification. The report of the excavation has not yet been published but a brief account may be given here of the main results.

The defences of the city were partially explored at two places and it was revealed that below the brick wall there were two successive earth ramparts. The core of the earlier rampart as well as the soil below it ~~yielded considerable quantities of grey pottery,~~ which, as will be seen below (p. 41), had been the distinguishing pottery from *c.* 300 to 100 B.C. Its existence in the core of the rampart is doubtless to be explained by the heaping up of mixed material brought from different places, and the absence of distinctive later pottery from the group suggests that the earlier rampart, the first fortification round the city was erected not much later than B.C. 100, in which case it might be connected with the advent of the Pāñchāla rulers known to us from their coins dating from the first century B.C. It is also significant that the earliest occurrence of these coins is associated with the first brick-built structures of Ahichchhatra.

It may be said at once that excavation did not reveal anything prehistoric, and any attempt to connect the city with the Ahichchhatra of the *Mahābhārata* must be regarded as premature. There is evidence for a settlement consisting of *kuccha* structures in the area before the Pāñchālas, but it is represented by only two strata (VII and VIII)—Stratum IX was devoid of structures—and is unlikely therefore to have been much earlier than B.C. 300.[3]

Another feature in the defence of the city was a long partition-wall dividing the fortified area into two sections—eastern and western; it was evident that the wall was erected during a late period in the life of the city and that the eastern section ceased to be occupied after its erection.

Occupation inside the city was more or less continuous till A.D. 1100, when it was finally deserted. Excavation unearthed successive strata of residential houses, streets and brick temples. Of the last there were two conspicuous and architecturally important examples. They belonged to the class of terraced temples, possibly having their prototype in Buddhist *stūpas*, each terrace having circumambulation paths round a square body, the frame of which was made of cells filled with earth. Both of them underwent many restorations and extensions, which resulted in horizontal and vertical increases to their dimensions. One of them, the eastern, was founded on a layer of typical Stratum IV pottery ascribable to the Kushan period and cannot therefore be earlier than early Gupta (fourth century A.D.). Both temples remained in use till the desertion of the city.

For purposes of excavation the whole of the fortified area was divided into plots designated as AC I, AC II, AC III, etc.[4] Each plot was usually a distinct mound separated from each other by long depressions, probably representing ancient streets. Among the excavated plots it was in AC III alone that we started from a sufficiently high level to be sure that the area had been in occupation till the last days of the city. Here we reached the natural soil by cutting through successive strata. A cross-section of all the structural stages of Ahichchhatra, however limited in extent, has thus been exposed to view, and the knowledge gained affords a stratigraphical basis for dating objects found elsewhere in the city and particularly for studying the evolution of pottery types. For this reason the pottery from AC III has mainly been utilized for illustrating this paper, other plots being occasionally referred to for comparative study.

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[1] A. Cunningham, *Archaeological Survey Report*, I, 255ff.

[2] A. Führer, *Progress Report of the Epigraphical and Architectural Branches of the N.W. Provinces and Oudh* for 1891-2, pp. 1ff.

[3] The pottery mentioned in Appendix B remains at present an enigma and does not warrant any pushing back of this date.

[4] The letters AC represent the abbreviated form of Ahichchhatra.

Ahichchhatra, if the excavated remains in AC III may be regarded as typical of the whole city, has not yet produced that feature which is found in many other stratified sites in India, *viz.* a well-planned city continuing practically unchanged through the ages. Here each stratum had its own plan and alignment of houses radically different from those of the next earlier or later stratum. Altogether nine distinct strata, some of them comprising more than one stage of occupation, were identified. Of these Stratum IX, the earliest level of occupation, was not represented by any structural remains but by two pits cut into the natural soil. Strata VIII to V were excavated in a more restricted area than the four later ones. Strata VIII and VII contained the remains of *kuccha* houses but were nonetheless rich in finds. Stratum VI, the period of the first brick-built structures, and Stratum V contained the scanty remains of residential buildings. Stratum IV consisted of several blocks of single contiguous chambers; it was characterized by fine brickwork usually resting on a bed of rammed concrete and marked the most prosperous period of building activity in the city.

Stratum III contained as many as four stages of construction, one of which (*c*) contained the ruins of a massive temple-compound apsidal in plan, and the next upper one (*b*) of a temple with three shrines and some ancillary structures. Stratum II consisted of two poor residential houses and a number of pits filled with ashes and potsherds, probably débris from potters' kilns. Stratum I comprised blocks of residential buildings separated from each other by streets and lanes.

The strata have been dated mainly on the basis of the latest coins found in each. The pits of Stratum IX did not contain any coins, but Stratum VIII yielded a fairly large number of round cast coins with simple symbols, and Stratum VII square coins with more elaborate symbols in addition to the round ones. The entire absence of Pāñchāla coins, found in profusion in all the upper strata, leads to the conclusion that these two strata antedate the advent of the Pāñchāla rulers (first century B.C.).

Pāñchāla coins are first met with in Stratum VI, mixed with cast coins, a feature shared by Stratum V. Stratum IV is characterized by the first appearance of Kushan coins, its last stage containing imitation Kushan coins as well.

On various considerations Stratum III has to be given a longer life than the others. Coins of Achyu (identified with Achyuta defeated by Samudra-Gupta in A.D. 350, or perhaps a decade or so earlier) occur for the first time in the earliest stage (*d*) of this stratum. Another more or less reliable clue to the dating of this stratum is afforded by a collection of large-size terra-cotta images of Brāhmanical deities which were found in the temple of the seventh century A.D., but their dating rests only on stylistic grounds.

Stratum II did not yield any definitely datable object and for its dating we have to depend on the dates of Strata III and I. The date of Stratum I is fixed by the find of two hundred and three debased Indo-Sassanian coins of Ādivarāha and Vigraha[1] in three different hoards below the walls of a house, where they must have been deliberately buried by the owner of the house, besides stray finds elsewhere in the stratum.

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[1] While Ādivarāha is certainly Bhoja of the Pratīhāra dynasty (*c.* A.D. 835 to 885), Vigraha is usually identified with one of the three Vigrahapālas of Bengal. Though this is not definite it would be cautious tentatively to regard the coins as belonging to the last king of that name (*c.* A.D. 1055–1081).

The following dates may therefore be tentatively proposed for the different strata, though some modification may be necessary after more thorough exploration:—

Stratum IX: before B.C. 300.
Stratum VIII: B.C. 300 to 200.
Stratum VII: B.C. 200 to 100.
Strata VI and V: B.C. 100 to A.D. 100.
Stratum IV: A.D. 100 to 350.
Stratum III: A.D. 350 to 750.
Stratum II: A.D. 750 to 850.
Stratum I: A.D. 850 to 1100.

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THE POTTERY TYPES

By K. C. Panigrahi

General Characteristics

The number of vessels and sherds recovered from AC III is very large, but the present paper deals only with the main types, which, by reason of their outstanding characteristics, mark the main changes in the pottery sequence of Ahichchhatra. Overlaps of pottery-types from one stratum to another are sufficient to suggest a continuous occupation of the site during the fourteen centuries. Each stratum is, however, distinguished by individual features, and over a prolonged period we find a broad change which extends not only to the shapes of vessels but also to their technique, ware and decorative designs. Such broad changes divide the types under review into three main groups: those of the first, second and third strata form the *late group*; those of the fourth, fifth and sixth the *intermediate group*; and those of the seventh, eighth and ninth strata the *early group*. We shall begin our description of these groups from the early to the late, but in doing so, we shall not change the top-to-bottom numbering of the structural strata.

Early group.—Owing probably to the limited area in which the earlier levels were exposed, the shapes of the vessels of this group are remarkably few, and the utilitarian purpose of some of them is difficult to determine. The finds of this group from AC III are very limited in number and similar finds from other plots have therefore been taken into consideration.

The outstanding change that divides this from the two later groups is the presence of grey wares which form a large percentage of the total output. Some of these grey wares have a black slip and one variety has a black surface with a grey core. To this group belong the highly polished black or brown sherds of which the earliest associations at Ahichchhatra have yet to be determined. They have, however, never been recovered from any stratum which did not yield grey pottery. They are rare among the finds of AC III, but they occur in other plots along with grey wares. Save in two or three specimens, they do not furnish any clue as to their shapes. The black polished ware is further discussed in Appendix A, p. 55.

The vessels of the early group are mostly plain; exceptions are a few red wares bearing stamped designs. The grey wares are, as a rule, devoid of all decoration. The whole group is marked by the complete absence of painted decoration of any sort,[1] and moulds are never used.

Intermediate group.—The small number of vessels recovered from the fifth and sixth strata provides only a limited scope for judging their characteristics. They appear to have belonged to a phase of which the pottery of Stratum IV exhibits more clearly the outstanding characteristics.

This group is marked by the total disappearance of the grey and black polished wares. The complete absence of the mould-technique and of incised and painted decoration are features which it shares with the early group but which differentiate it from the late. Decoration was formed only by the stamp and mainly consisted of symbols such as are found on Indian coins and sculptures from the first century B.C. to the third century A.D.

Most of the vessels are devoid of slip or wash. Powdered mica is not used.

Late group.—The main types and variants of this group form a large series, with minor differences which mark successive sub-periods. Utilitarian devices such as lug-handles and spouts were borrowed with modifications from earlier models, the only new invention being interrupted groups of indentations on the rims of cooking-pots.

Wheel-made pots are predominant, but mould-made pots form a fair percentage. Most of the vessels are common red wares with red or reddish slip. Vessels of special types are mica-dusted to impart a lustrous and metallic surface, and mica is sometimes used as a wash on the decorated bands of mould-made jars. Some specimens, not inconsiderable in number, show a polished red ground and are easily distinguishable from the rest by this peculiarity.

Decoration consists mostly of rectilinear or curvilinear geometrical patterns, spirals, zigzags and pendants of various types. They are imprinted by moulds or stamps, or are incised with blunt points. The last device was a favourite method for emphasizing stamped designs. The painted specimens of this group show simple designs of narrow or broad bands in black pigment on a red ground.

We may now deal with the distinctive types of the individual strata one by one. All pots are wheel-made unless otherwise described.

STRATUM IX (FIG. 1, 1–5)

(*Before B.C.* 300)

The ninth level revealed no sign of general occupation. Most of the pottery-types under consideration were recovered from a pit (No. 25) unconnected with any structural remains. They exhibit a distinctive culture in the absence of the heavy and whitish types of grey wares which are profusely found in the two next higher levels, and in the presence of types peculiar to itself.

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[1] Unless the painted ware referred to below, p. 58, should be ascribed to this phase.

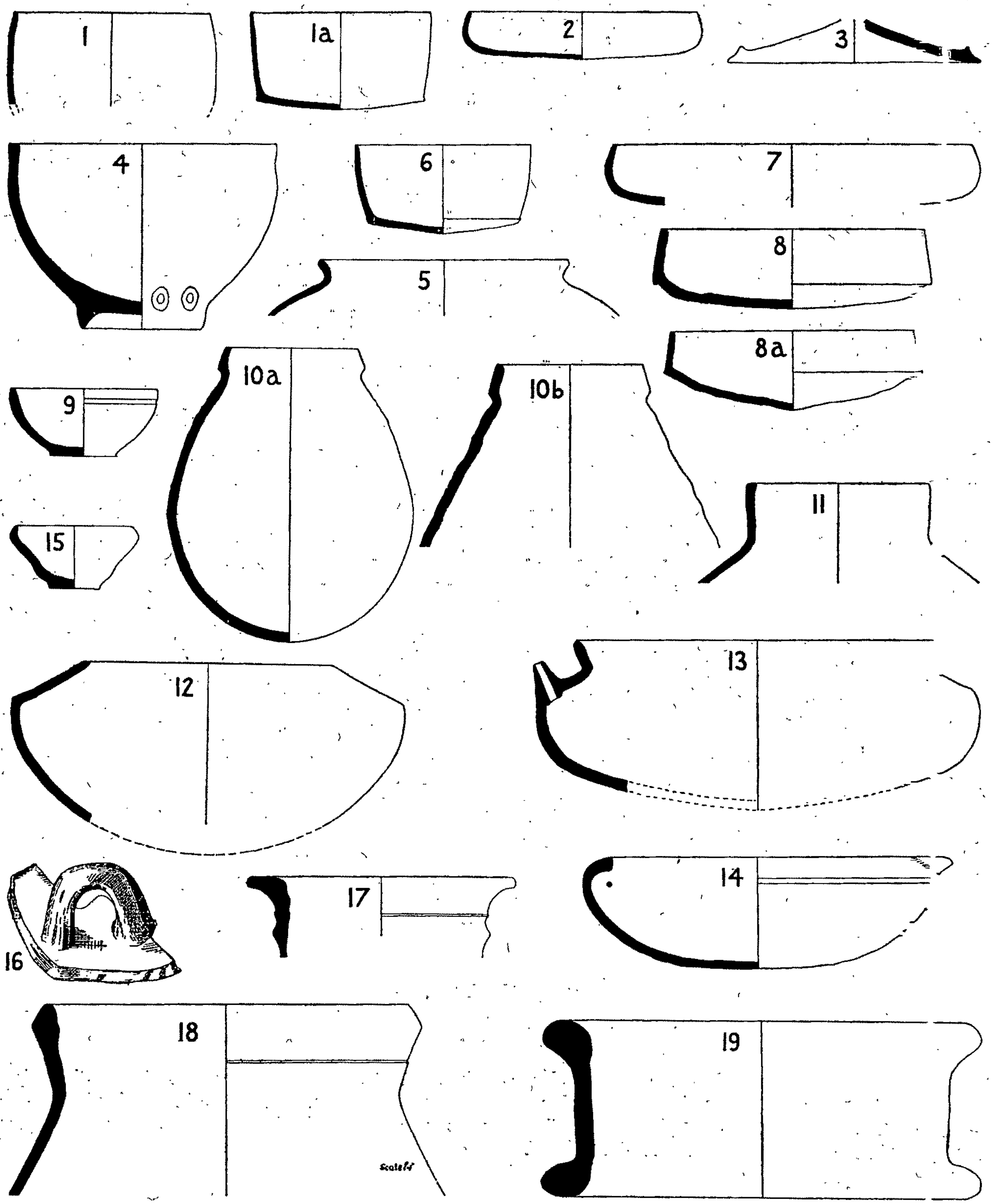

FIG. 1. *Types 1–19.* ¼

The typical light grey ware is illustrated by the bowl type 1. It has extremely fine-grained and thin walls, corrugated inside and smoothed outside. Type 1a seems to be of similar type. The surface colour of both the specimens is greenish. The shallow dish, type 2, with rounded sides and base, reveals the same quality of clay. It has in addition faint traces of a black slip on its exterior. The dish or lid, type 3, departs from the conventional shapes of the grey wares. It has a black slip on a thick fabric of fine-grained clay, and a shallow groove round the outer rim.

Among the red wares, the bowl, type 4, is of interest. It is of rough grit-laden clay and has a hollow foot, above which are oval-shaped perforations. The purpose of the perforations is not clear; in a strainer they would be expected to occupy the centre of the base.

The vessel, type 5, with a small rim, thin walls and brown-red surface is notable both for its shape and colour.

The pottery of this level is wholly undecorated.

STRATUM VIII (FIG. 1, 6–16, excluding 8a)

(*B.C.* 300 *to* 200)

A few specimens of light grey ware that survived into this level from Stratum IX show no signs of change. The deep bowl, type 6, for instance, is undistinguishable from the similar vessels of Stratum IX (type 1a).

On the other hand, the shallow dishes, type 7, show a slight change, in that they are somewhat heavier and are whitish in colour.

Type 8 is of heavy grey ware, and its thicker walls and slightly convex base distinguish it from type 2 in Stratum IX. Another heavy specimen is type 9, which is similar in shape to the commonest red bowl of the later strata (types 29 and 46). It is of coarse gritty ware with a darkish grey core and an irregular band of black slip on the upper portion of the outside surface.

Among the red wares, the jar types 10a and 10b may be taken as the principal guide-type of the stratum. It has some similarity with the principal type of Stratum IV (type 37), but in contrast it has a lighter body with thinner walls, traces of the ridges produced by the wheel (but not the beater marks), and a red surface. It has no well-defined neck; the body starts abruptly from the rim. In Stratum VII this type became slightly thicker, with a shallow groove on the rim.

The jar, type 11, is typical of a class of darkish buff or light red ware in surface colour, with neck rising straight from the shoulder and ending in a flat horizontal rim. The characteristics are unmistakable and are distinctive of jars of this stratum on all plots.

The curiously shaped vessel, type 12, is always found with a burnt base, indicating the purpose to which it was put. It has no rim, but the in-turned upper portion of the body serves the purpose of a rim. Another pot, type 13, is also found with a burnt base. It has a short slightly out-turned rim and a small spout probably meant as an outlet for vapour. It is curious that the cooking vessels in the early period are always found with very short rims or no rims at all, a deficiency which must have been a serious handicap in use.

The lipped bowl, type 14, of this stratum departs from its analogue of Stratum IV (type 34), in that the space between the protruding lips is shorter, the vessel is shallower, and there is a narrow groove below the rounded rim. A red slip is generally present. The type survived into Stratum VII and probably into Stratum VI but the specimens recovered from these strata are too fragmentary for comparative study.

The commonest bowl in Stratum VIII, type 15, is of small dimensions with a flat base and in-turned rim.

The fragmentary specimen, type 16, with an internal loop-handle, gives no clue to its original shape, since no complete specimen has been found, although fragments commonly occurred at this level.

Among the decorated specimens, the design stamped on a tiny sherd deserves notice (fig. 7, 1). It consists of four conjoined taurines with a central prong, similar to those found on punch-marked coins. The taurine with the prong occurs also on grey terra-cotta animal figurines from the same stratum, and, without it, on cast coins from Ahichchhatra and Rājgir (Distt. Patna).[1]

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[1] J. Allan, *Catalogue of the Coins of Ancient India in the British Museum* (1936), Plate I, Nos. 1–6. For cast coins from Rājgir, see *Journal of the Numismatic Society of India*, I, pl. III.

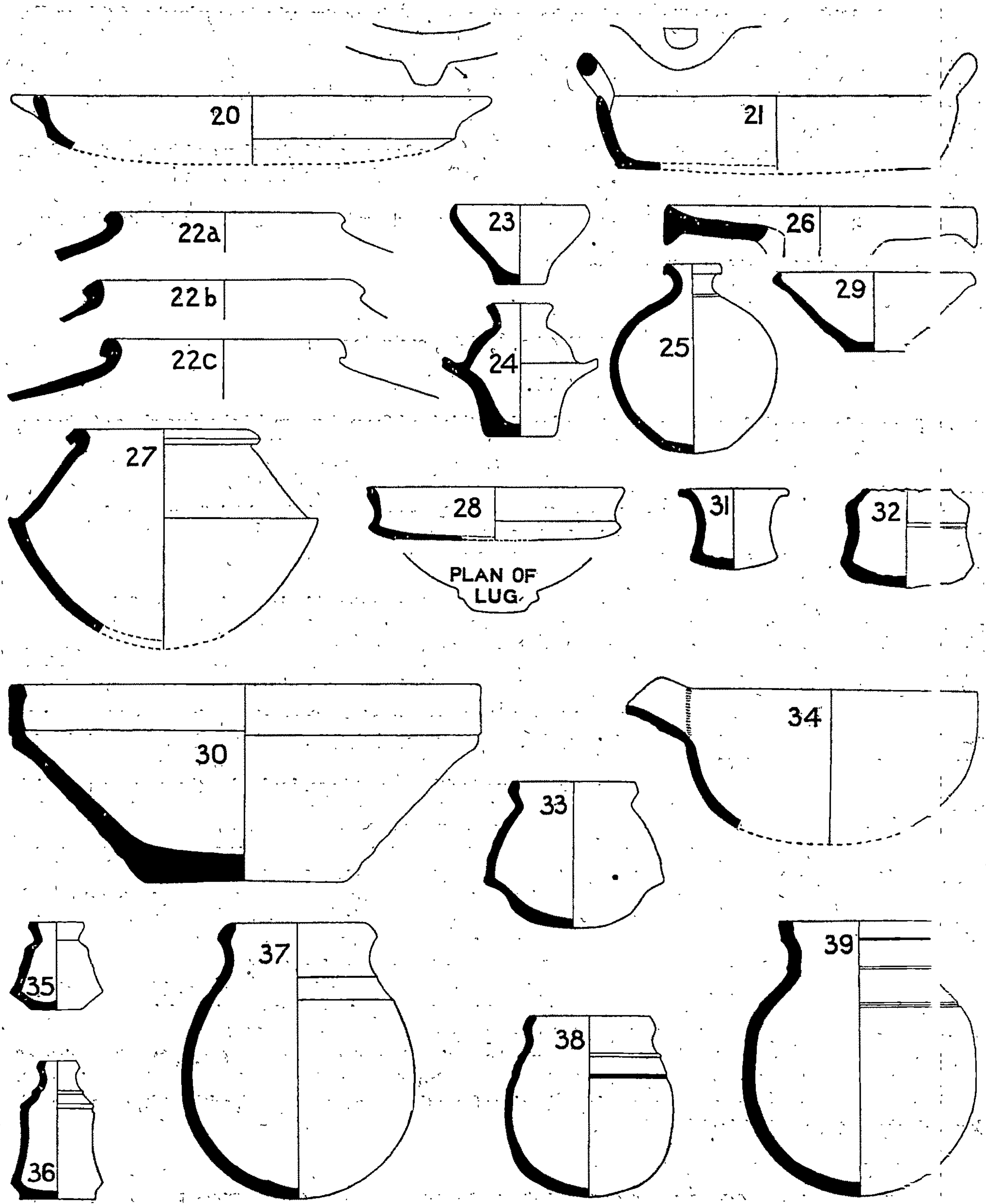

FIG. 2. *Types 20–39.* ¼

STRATUM VII (FIG. 1, 8a, 17–19)

(*B.C.* 200 *to* 100)

Stratum VII represents the last phase of the grey pottery culture at Ahichchhatra. The extremely fine-grained, thin and light grey wares with somewhat greenish surface have now become whitish and heavy with a paste of medium or coarse composition. The process of change can be summarized as follows. In Stratum IX all grey wares are thin, light and free from grit, and are undecorated. Survivals of these wares occur in Stratum VIII alongside heavy and whitish types. Some of the heavy types have a black slip and occasionally a rosette or other circular design stamped inside the base. In Stratum VII only the heavy wares survive, sometimes with slip but never with decoration.

The typical vessel of this decadent series is 8a, which appears in this stratum with convex base and vertical sides. A black slip is commonly found on the lower part of the vessel, rising slightly above the carination.

The range of shapes of the grey wares in all these strata is very small, being five or six in number. All are bowls or shallow dishes; no vessel of large size occurs in this grey fabric. Of the forms, types 2, 8, 8a and 9 lasted into Stratum VII with a change in quality of clay but not in form. The shapes remain fundamentally unchanged.

The distinctive jar, type 17, with a pronounced lip and a deeply grooved neck may be taken as one of the guide-types of the period. Stratum VII yielded a few fragments of this type, and a large number was found on AC V in association with type 8.

Type 18, probably a storage jar, is notable both for its shape and colour. It has a blackish buff surface which is not usual in this period. Its clay reveals husks or chopped straw, an ingredient which is generally found in the clay of the storage jars of the upper strata, particularly I–III.

The pot-stand, type 19, first occurs in this stratum. Unlike the pot-stand of Stratum I (type 69) it is of medium size and fabric, with a concave profile.

Of the few decorated sherds recovered from this stratum, one bears a stamped taurine (fig. 7, 2) and another stamped designs of semicircular pendants with hatchings (fig. 7, 3). Close combings are also a feature (fig. 7, 4).

STRATA VI AND V (FIG. 2, 20–26, excluding 22c)

(*B.C.* 100 *to A.D.* 100)

These two strata together cover a period of about two centuries during which no major change can be detected. The finds are fragmentary and not numerous. A few types can, however, be identified.

Cooking-pans with loop-handles or small lug-ears on their rims are the main types of the period, types 20, 21. They were all found with burnt bases, sometimes with soot sticking to them. They persisted without change into Stratum IV, though with less frequency.

Jars of gritty fabric and with no well-defined necks occur frequently (types 22a and 22b). In Stratum IV they are found to have slightly changed, their necks now being somewhat more pronounced (type 22c).

The flat horizontal rim is a peculiarity of the small jars of Strata V and VI. In Stratum VI, unlike the later strata, the commonest bowl has a footed base, a small body and an incurved rim (type 23). These are distinctive features.

The bowl-shaped stopper, type 24, designed for the insertion of the fingers, is found for the first time in Stratum VI. It is of fine clay with smoothed surface and red slip.

A bellied jar, type 25, with a small bottle-neck and rounded base is a type of rare occurrence. It first appears in Stratum VI and continues to Stratum IV.

Type 26, in the present state of our knowledge, can be connected only with Stratum VI. It is a stand with a shallow disc supported on a hollow stem and probably having a similar disc at its lower end to form the base. It has a red slip. It does not occur in any other stratum, but its prototype seems to be very ancient, going back to the period of the Indus Valley civilization.[1]

A few sherds have rough decoration in the form of close combed bands.

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[1] M. S. Vats, *Excavations at Harappa* (1940), II, pl. LXX, 11–14; E. J. H. Mackay, *Further Excavations at Mohenjo-daro* (1938), II, pl. LV, 1–5.

STRATUM IV (FIGS. 2, 22c and 27–39 ; 3, 40–44)

(*A.D.* 100 *to* 350)

The pottery of Stratum IV is marked by strongly individual features. It was indeed thought at the time of excavation that there was a break in the pottery sequence between Strata III and IV, but subsequent investigation has established a correlation between the finds of Stratum IV and the earliest stage of Stratum III. Nevertheless Stratum IV shows more innovations in pottery types and decoration than any single one of the preceding or succeeding levels.

Lug-handles or indentations on rims, characteristic of later periods, are not yet found on the cooking-vessels, of which many specimens with burnt bases have been recovered. Type 27 represents this class of vessel and has a plain rim, truncated base and prominent ridge on the body. Lug-handles are, however, found on the rims of the shallow troughs which are common to both Stratum IV and the earliest stage (*d*) of Stratum III (type 28). The idea of lug-ears seems to have been borrowed from these specimens for the later types of cooking-vessel.

The common types of bowl, types 29 and 30, show certain characteristic features: notably a flat base and above them the minimum diameter, gradually increasing upwards to an in-turned rim. This type has been ascribed to the Kushan period at Maholi near Muttra.[1]

The small bowl, type 31, of coarse ware with out-turned rim is a scarcer type. It occurs also in the third (*c*) of the four stages of Stratum III.

Carinated and 'waisted' jars, type 32, are of rare occurrence. They survived, however, with slight modifications into the earliest (*d*) stage of Stratum III, but are unknown from any other stratum. Another type without the 'waist' and with a rough exterior is similarly rare but is distinctive (type 33). The lipped bowl, type 34, met with in this stratum completely disappears in all the higher levels. It is perhaps strange that so convenient a device as the protruding lip should have been abandoned by the later potters, who are generally found to retain utilitarian devices of obvious value.

The small or miniature jars of this period, types 35, 36, generally have a slightly concave profile above the basal carination.

The jar, type 37, was abundant and became the hall-mark of Stratum IV. Wherever the stratum was struck the type was obtained in large numbers. Ovoid in shape, it has thick walls and sometimes a thicker rounded base, with beater-marks all over the body. It has no slip, but two detached ribbings left by the touch of the potter's fingers form a sort of decoration on this otherwise plain vessel. Its abundance and careless potting suggest that, like the commonest bowl, it was intended for discarding after use. A variant, type 38, has a shorter and more globular body. Another variant, type 39, adds a flat horizontal rim.

Jars of smaller dimensions generally with flat horizontal rims, sometimes with grooves immediately below them, are peculiar to Strata V and VI. But they also occur in the earlier stages of Stratum IV. Type 40, with this peculiarity of rim, red slip and stamped designs of *nandipadas* alternating with rosettes, is a notable specimen from the second (*b*) stage of this stratum.

Of the bottle-necked jars, type 41 with flaring lip is common both to Stratum IV and to the earliest stage of Stratum III. Type 42, with a globular body, rounded base and vertical neck, belongs only to Stratum IV. The ribbing on the shoulder and body is usual. Type 43, with a slight concave base and a long bottle-neck, is a rare type.

The purpose of a curious vessel, type 44, which has loop-handles on its grooved rim and a solid knob and hollow cup inside, remains an enigma. Only one specimen was recovered from AC III, but the type was met with on other plots in levels assignable to this period.

A number of sherds from this stratum bear one or more stamped designs and symbols, notably the *nandipada*, *svastika*, snakes flanking a central pillar or trident (Nāga symbol) and the twin fish. To these may be added three other symbols, viz. the taurine, *tri-ratna* surmounted by *dharma-chakra*, and *chaitya* or hill with crescent on the top, which are not represented in the finds of AC III, but occur in the equivalent ceramic groups from other plots. All these symbols frequently occur on ancient sculptures and on tribal coins belonging to the period from the third century B.C. to the second century A.D., but never on the coins of the Gupta and post-Gupta times.

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[1] *Journal of the U.P. Historical Society*, XV (1940), pl. I.

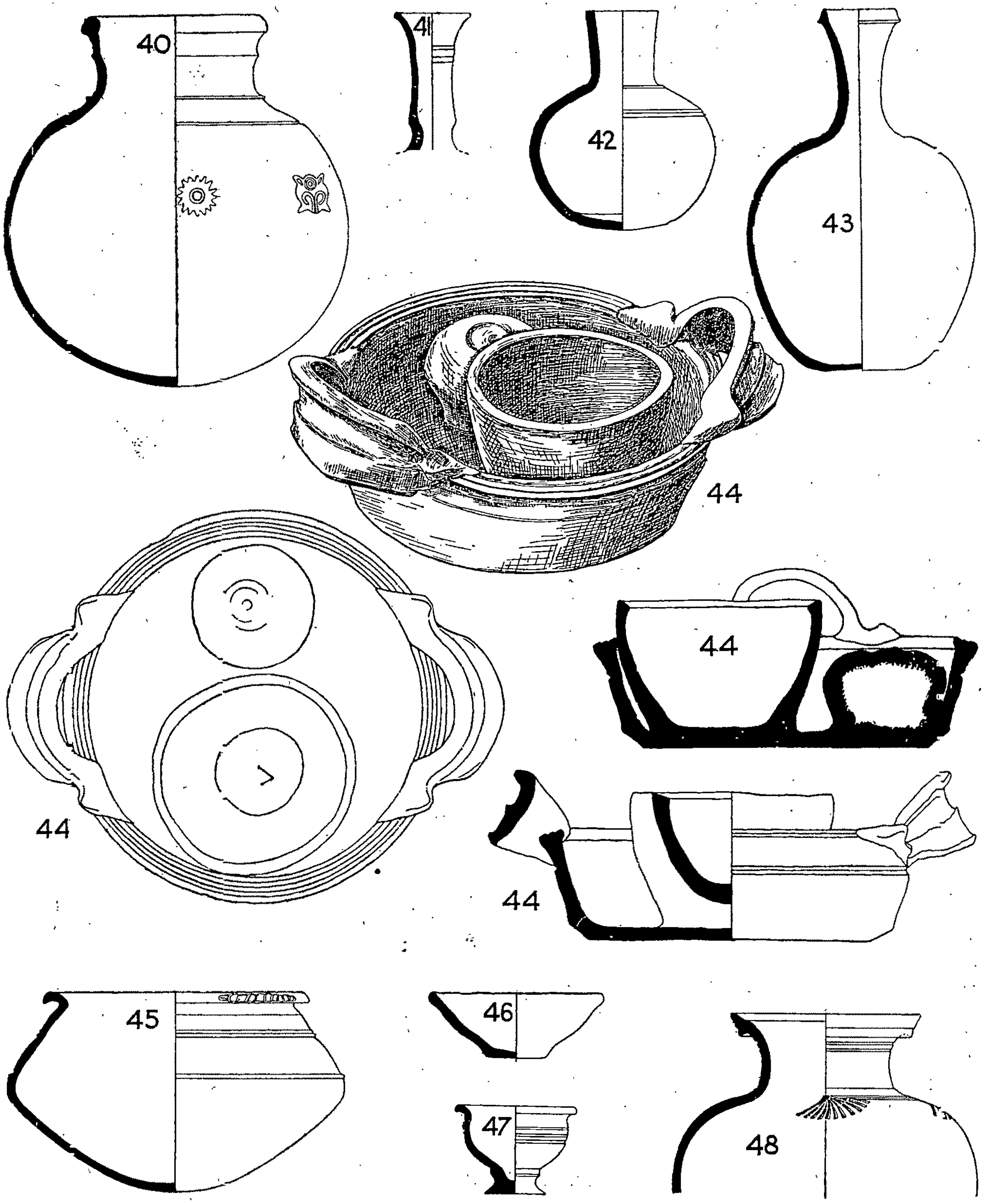

FIG. 3. *Types 40–48.* ¼

They therefore provide independent evidence of the lower limit of the age of the stratum. See fig. 7, 5–10 ; 8, 15.

Of these symbols, only the *nandipada* survived into the later strata, but its degeneration suggests that the potter now had only an imperfect understanding of the original form of the symbol. In the upper levels it sometimes loses its original form to such an extent that it looks almost like a floral device (cf. fig. 7, 11) The taurine as a decorative design goes back to Stratum VII, but for the most part symbol-decoration belongs to the stratum under review.

Other decorative devices that can also be taken as guide-patterns are leaf-designs, scored hatching of elongated shape, and a form of rosette which has dots or detached petals between the main petals radiating round the corolla. A large variety of rosettes was used as decoration on bowls from later levels, but this form of rosette is not found among them. It occurs on the tribal coins of Eran along with other religious symbols.[1] There can be no reasonable doubt that both this form of the rosette and the other symbols were in wide circulation prior to the second century A.D. (figs. 7, 12 ; 8, 13).

It has already been observed that incised decoration is absent from the intermediate and early groups of pottery. Incision with the comb is, however, an exception to this rule. Close combed bands formed a definite feature in the decorative designs of these groups.

Applied bands with finger-impressions or hatchings and applied *svastikas* (fig. 8, 16) sometimes decorate the bodies of very large storage vessels. Knobs as decoration on a small number of wares also deserve a passing notice (fig. 8, 14).

STRATUM III (FIGS. 3, 45–48 ; 4, 49–54.)

(*A.D.* 350 *to* 750)

Stratum III covers a larger period than any other and is marked by four stages of occupation designated *a*, *b*, *c* and *d* from the latest to earliest. While the pottery forms and decorative designs of the *a* and *b* stages

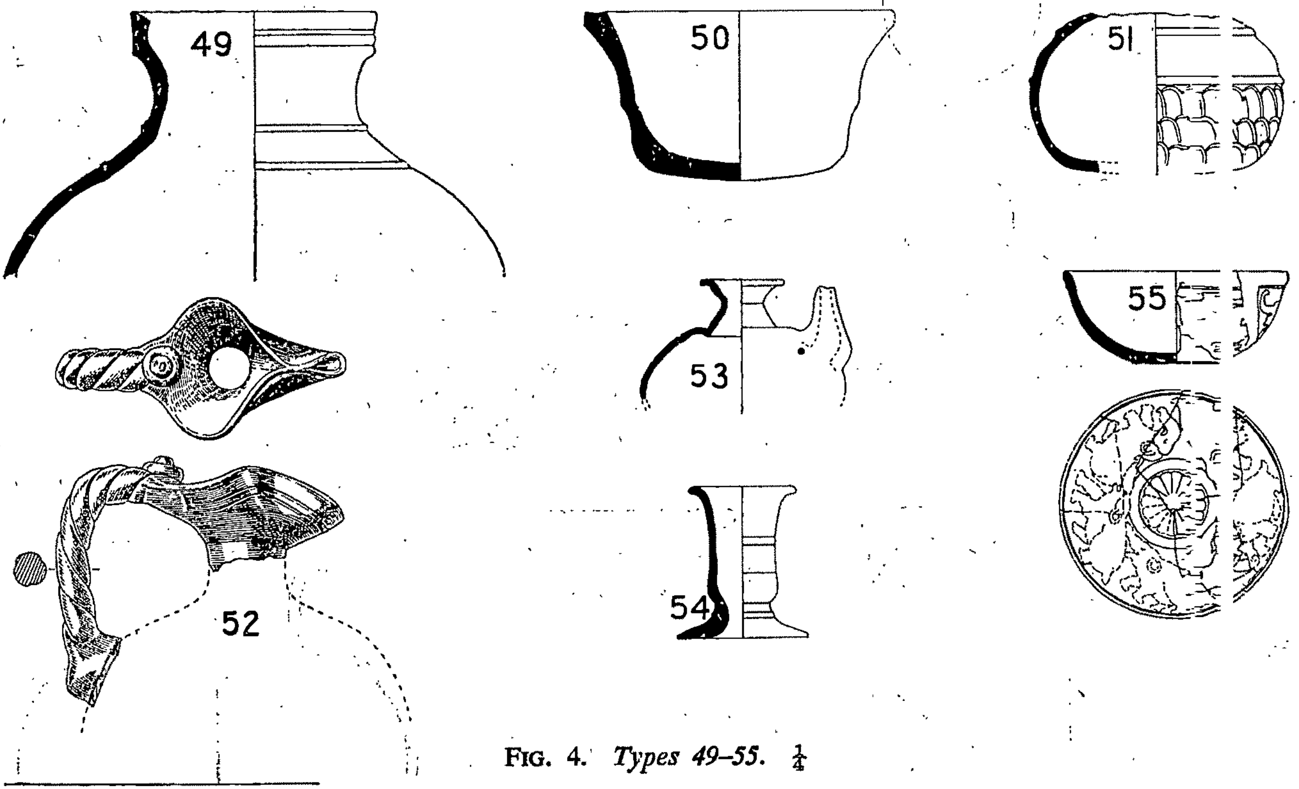

FIG. 4. *Types 49–55.* ¼

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[1] J. Allan, *Catalogue of the Coins of Ancient India in the British Museum*, p. 142, pl. XVIII.

show strong affinities with those of the upper strata, the ceramics of the two earlier stages form a family group with the pottery of Stratum IV. So far as pottery is concerned, the *d* stage virtually merges its identity into Stratum IV, mould-made vessels being conspicuous by their absence.

From the last two stages of occupation, cooking-vessels with indentations and lug-ears on their rims have been recovered; in Stratum III the former, type 45, are globular and the ridge is less prominent than in the upper strata.

The common bowls, type 46, show thick walls and slightly incurved rims. In the pedestalled bowls or incense-burners, type 47, the pedestal is solid and short.

Type 48 represents the common jars in the *a* and *b* stages, but the prevalent type of the same vessels in the *d* stage, type 49, has a flat rim and bears a close resemblance to a type from Stratum IV. A similar connexion is found in the jars with bottle-necks and flaring lips, type 50. A bowl with thick coarse walls, flat base and flaring body, type 51, is also common to Strata III and IV.

The guide-types of the period are all mould-made. In fact, this is the most fruitful period of the mould-technique. The mould-made decorated bowls appear in the last two stages of occupation, and show distinct refinement both in potting and in decoration. The best guide-characteristics are found in the finer jars, of which many fragments but few complete specimens have been recovered. They have generally two or three cordons, with ribbings or ridges demarcating their limits, and show on the reserved bands a polished red ground, and on the decorated bands designs such as beads or fish-scales in relief. Powdered mica is sometimes used as a wash on the decorated bands to impart a metallic effect to the reliefs. A medium-sized jar, not illustrated, is shaped and decorated in relief in imitation of a young jack-fruit, with a reserved neck portion showing polished red ground. Type 51 shows three bands, on the lower of which are fish-scales in relief, on the middle only a polished red surface, and on the uppermost a mica-wash on a reddish buff ground.

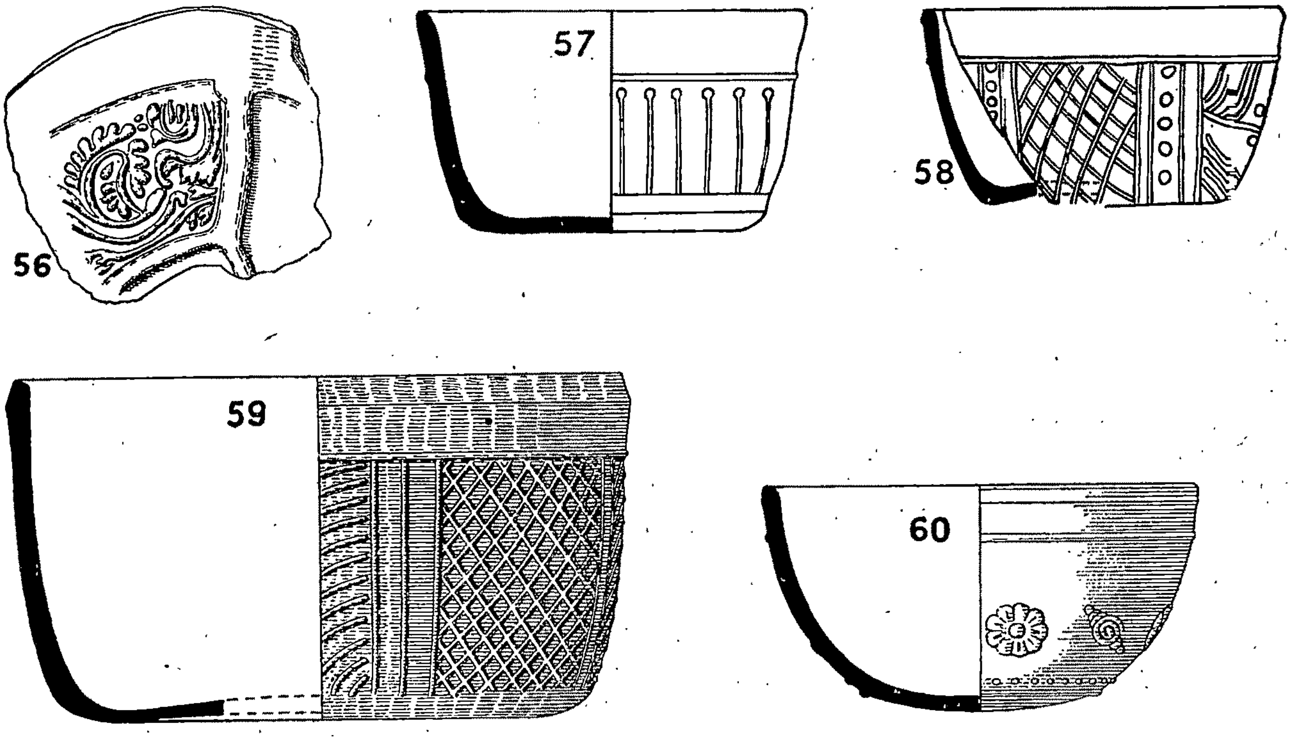

FIG. 5. *Types 56–60.* ½

The jug, type 52, is unique. It was found in association with terra-cotta images in Stratum III. It has a pinched spout, a loop-handle twisted in imitation of rope or twisted strands of metal, a polished black surface and a black core. All the characteristics of the jar are alien to the indigenous potter's craft and suggest that the vessel was an importation, probably from the direction of the Mediterranean.

In stages *a*, *b* and *c*, incised decoration continues alongside stamped and mould-made decoration but the last two are dominant. The most characteristic patterns are already the zigzags and grid designs of Stratum I. The stamped or incised designs of fan-shaped pendants are, however, typical of stage *a* (type 48, buff ware, decoration made with a blunt point). The ornate *nandipadas* used as pendants between a row of festoons, etc., are very common (fig. 7, 11). Incised designs do not occur in stage *d*.

Polished red ware of which degenerate specimens survived into the later strata is a remarkable feature in the pottery of this stratum. We have spoken of the polished red ground as a peculiarity on the reserved bands of mould-made jars. Besides these, we find the highly polished red surface also on wheel-made vessels. The small spouted jar, type 53, is polished red all over. The bottle-necked jar, type 54, is also a good specimen of polished red ware besides being an example of particularly fine potting.

The last three stages of this stratum yielded a large number of painted sherds. The designs are, as a rule, broad or narrow bands of black pigment on a red ground (fig. 8, 17). Only one specimen shows a more elaborate design: a black band with rows of projecting 'wolf's teeth' in parallel rows. The design has been executed on a yellowish ground instead of the usual red (fig. 8, 18).

STRATUM II (FIGS. 4, 55; 5, 56–60; 6, 61–63)

(*A.D.* 750 *to* 850)

Most of the finds assignable to this stratum were recovered from a thick layer of ashes and a number of pits. The types that can definitely be connected with the occupation-level are few in number.

A class of vessel known to the excavators specifically as 'decorated bowls' (types 55–61) may be taken as the principal guide-type of this level. They are all mould-made and bear on the slipped red ground a variety of designs in relief, such as uprights sometimes bifurcated at the upper ends; but generally with pellets mounted on either or both of the ends; beads running in horizontal or vertical rows within bands or borders of lotus-petals; geometrical patterns of oblique or cross-hatchings or concentric semicircles; and lotus petals shown in full profile. Various forms of rosettes figure independently or alternating with conch shells. Scrolls and arabesques occur only on exceptional bowls of elliptical plan, type 56. The animal designs are relatively realistic and free from stylization.

It is to be noted that a few of these vessels have also been recovered from Strata I and III, but the main period of their manufacture is that represented by Stratum II. In Stratum I they are mostly unsuccessful imitations of earlier models.

The spouted vessel, type 62, is typical of its class and has on the lower portion of the body a reddish buff wash.

Most of the other types from this stratum, e.g. the common bowls, miniature jars and cooking-vessels with big ears or indentations on their rims, continued unchanged into Stratum I. A difference in the rims of the jars, however, is a feature of the most prevalent types. While the jars of Stratum II (type 63) usually have grooves on their rims, those from Stratum I (type 64) are devoid of them.

The decorative designs, barring those on the 'decorated bowls', survived into Stratum I almost in the same forms.

STRATUM I (FIGS. 6, 64–77; 8, 19–21; 9, 22–25)

(*A.D.* 850 *to* 1100)

In Stratum I the common types show a distinct improvement on their predecessors. They retain the basic features of the latter, but have at the same time certain new devices which improve their utilitarian aspects. Thus the cooking-vessels, whilst retaining the ridges marking the transition from the lower to the upper profiles and forming barriers against soot creeping upwards, now also have lug-handles or indentations on their rims for easy handling when hot. See types 65–67. Of these three forms of cooking-vessel, type 65 occurs only in

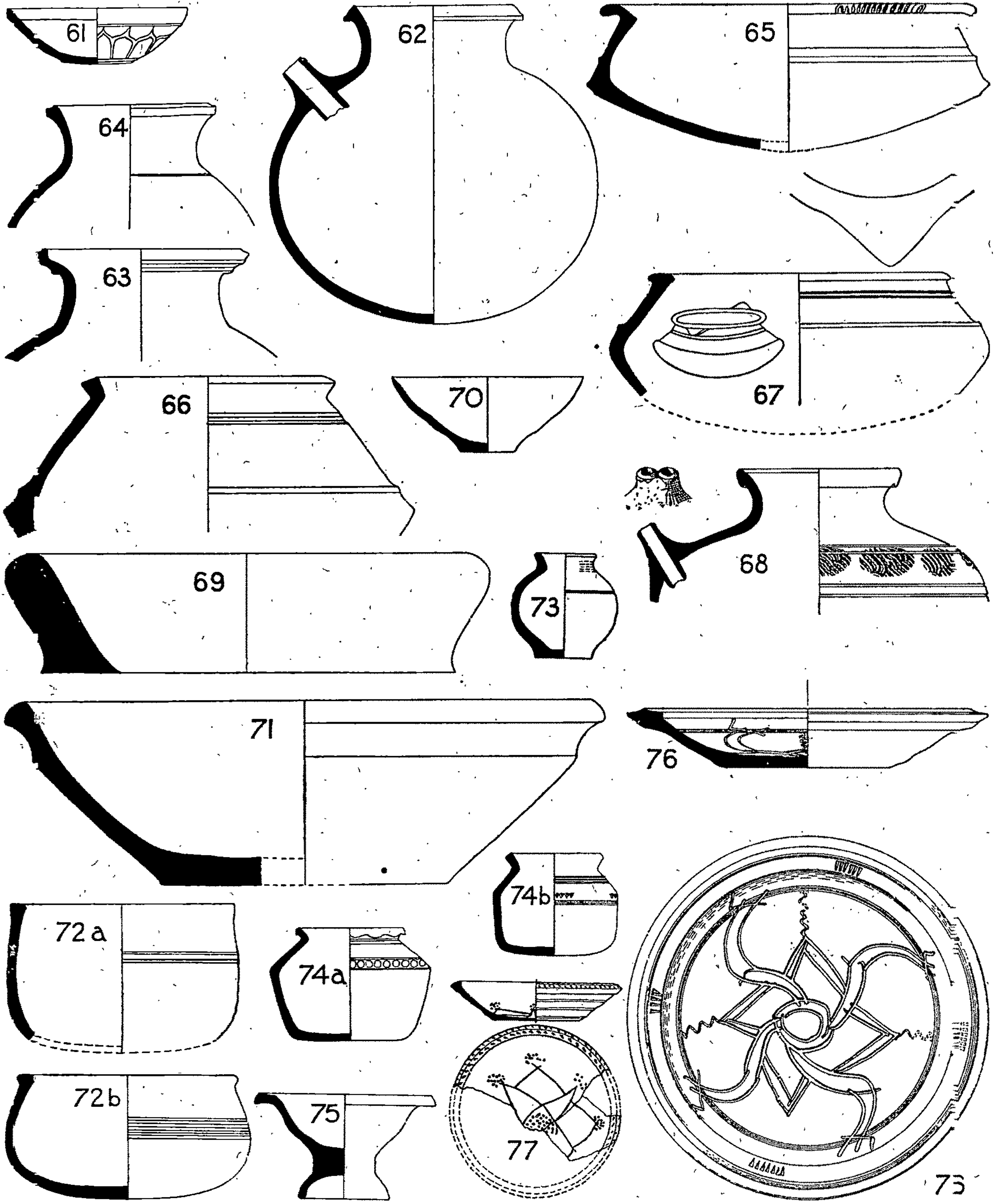

FIG. 6. *Types 61–77.* ¼

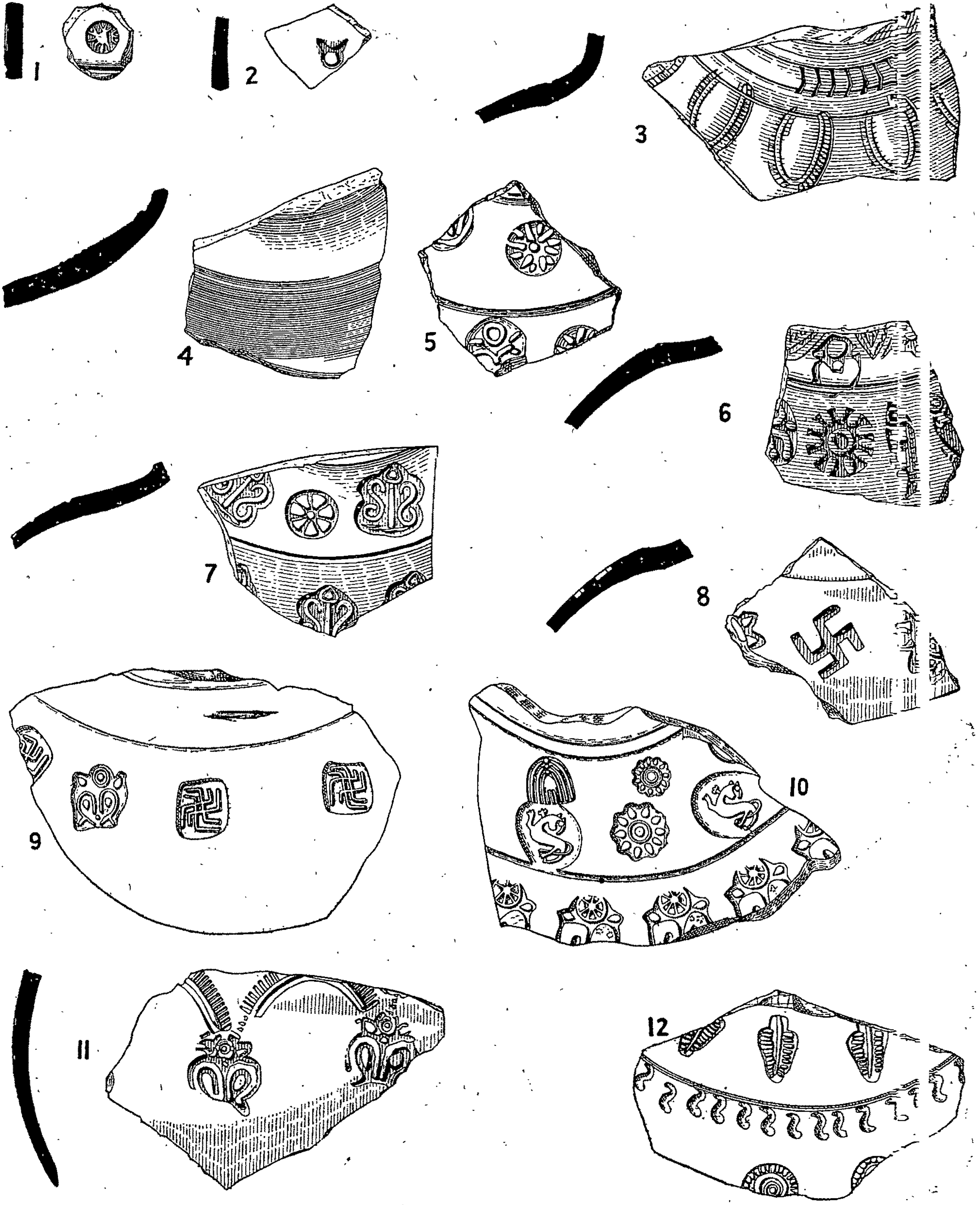

FIG. 7. *Decorated sherds.* ½ *1, Stratum VIII; 2–4, Stratum VII; 5–10, and 12, Stratum IV*

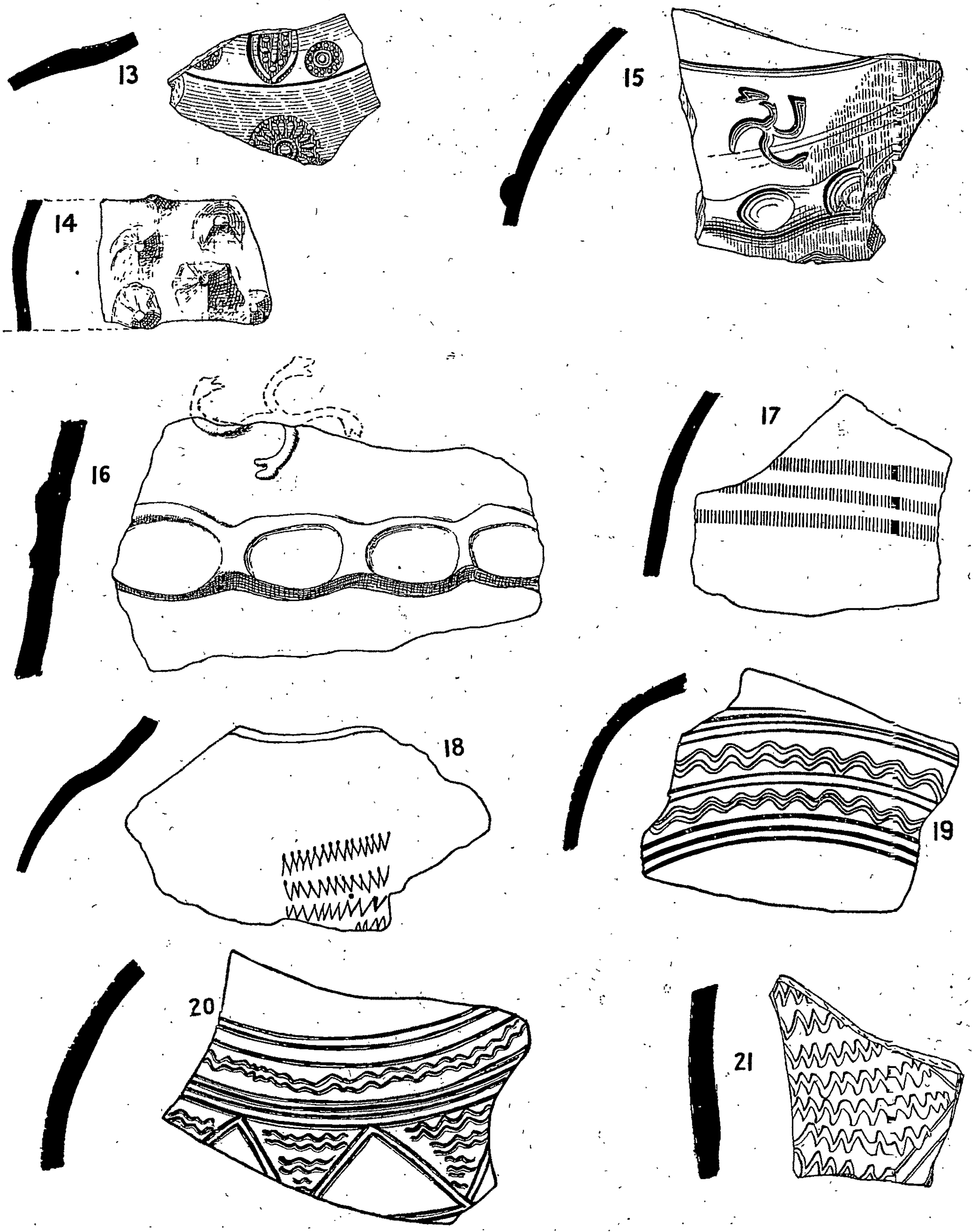

FIG. 8. *Decorated sherds.* ½ *13–16, Stratum IV; 17–18, Stratum III; 19–21, Stratum I*

Stratum I. The other two go back to Strata II and III, with some modifications. The double-spouted jar, type 68, is also an improvement on its earlier type with a single spout.

Ring-stands of large size with rounded or vertical sides for keeping large storage jars in an upright position, were revived in this period after a considerable lapse of time (type 69). Their prototypes, of smaller size, occurred in Stratum VII (type 19). The device of fixing storage jars in hollows scooped out of the mud floor, practised in the earlier strata, was abandoned in this uppermost stratum probably owing to the revived use of these ring-stands.

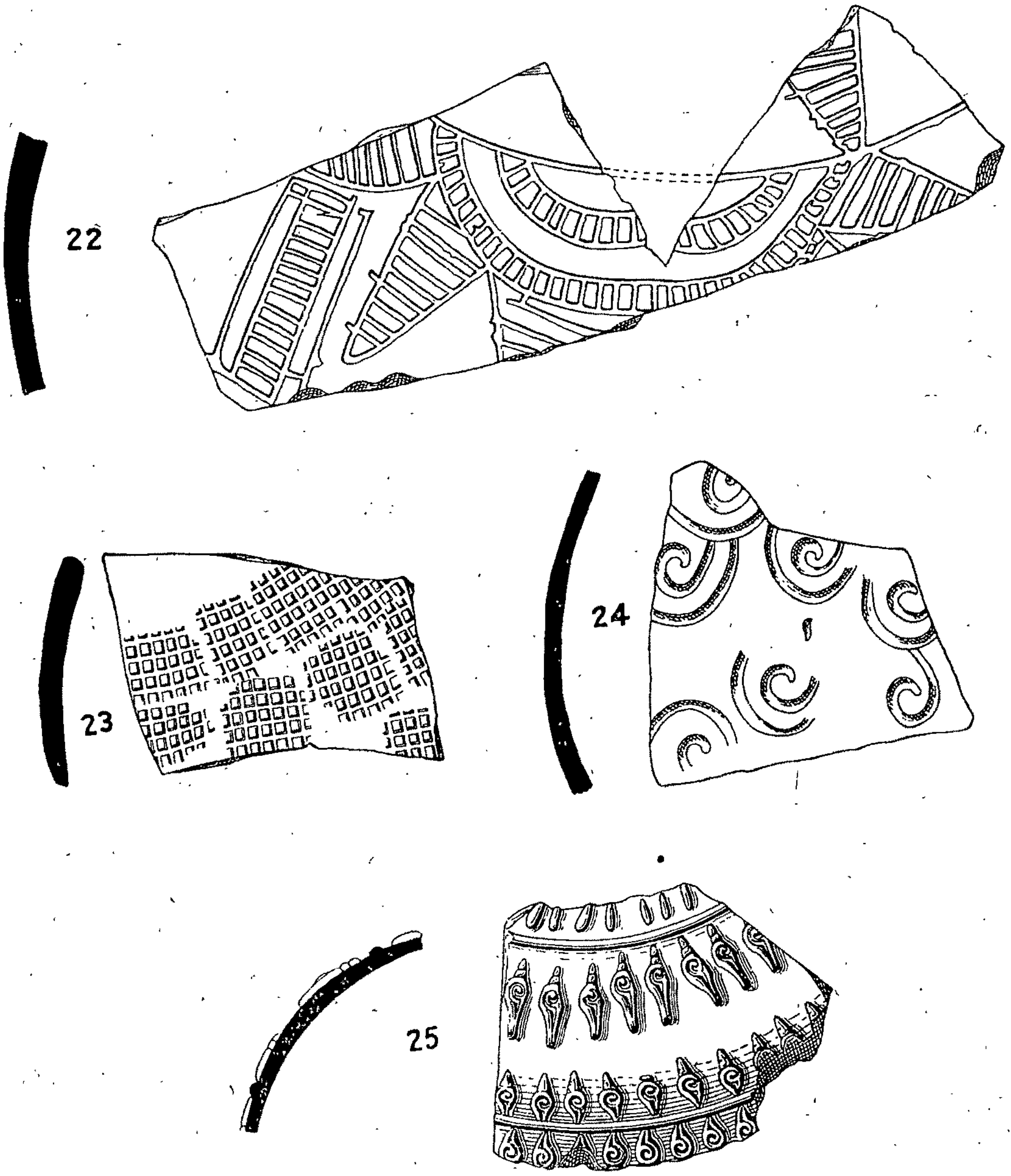

FIG. 9. *Decorated sherds.* ½ *All from Stratum I*

Two or three specimens will suffice to illustrate the types of bowl from this level. The most common type, of which innumerable specimens were recovered, is type 70, with a wide-open mouth, thin wall, knife-edged rim and the body corrugated by the wheel in contrast to the thicker walls and slightly inverted rim of the equivalent form in Stratum III. The base is very small in comparison with the body. It would appear that vessels of this type were made to meet temporary needs and, having once been used, were thrown away. Type 71 is another common form of bowl, undecorated and of a thick coarse fabric. It is usually found with a shallow groove below its rim externally. Another type of bowl peculiar to this level is a medium-sized vessel with vertical sides and flat horizontal rim, type 72a. Type 72b, with a slightly bulging body, is a variant of this type.

Miniature jars are represented by type 73, which contained fifteen debased Indo-Sassanian coins not earlier than A.D. 1055–1081. Typical of its class, it has a globular body and flat base and can easily be distinguished from the similar vessels of the intermediate group, which have a carinated profile. Biconoid small jars with incised decorations and ribbings below their necks are confined to this uppermost stratum and never occur below it (types 74a and 74b).

The pedestalled bowls, type 75, were probably used as incense-burners. In this stratum all the specimens recovered have the hollowed pedestal base.

The main types of decoration are incised rectilinear or curvilinear geometrical patterns, spirals, zigzags and nicks (figs. 8, 19–21 ; 9, 22-3). Zigzags cutting each other at the centres and conventional lotus flowers decorate the centres of the shallow dishes, types 76 and 77. Stamped decoration tends to become scarcer as time passes on. A fine specimen of mould-made decoration with rows of conch-shells in relief on a reddish buff micaceous ground is noteworthy (fig. 9, 25). A sherd with stamped spirals or tendrils deserves mention (fig. 9, 24).

Most of the vessels have red or reddish slips. A few degenerate pieces of polished red ware are survivals from Stratum III.

APPENDIX A

'NORTHERN BLACK POLISHED WARE' (FIGS. 10–11)

(N.B.P. ware)

By KRISHNA DEVA *and* R. E. M. W.

A number of sites in northern and north-central India have produced sherds of a distinctive highly polished ware which is of such quality as to suggest a common cultural origin and a limited duration. The fabric is a finely levigated clay which is usually grey but sometimes reddish in section, with a brilliantly burnished slip of the quality of a glaze, ranging in colour from jet-black to grey and a metallic steel-blue, occasionally varied with reddish brown patches. The ware is readily distinguishable by its brilliance from other polished or graphite-coated black wares which occur also in South India. The normal forms are (i) a dish with more or less convex base and incurved sides (fig. 10, I–III, etc.), and (ii) a small bowl with convex and sometimes corrugated sides, sometimes also with a slightly flanged lip to receive a lid (fig. 10, IX–XII). A fragment of exceptionally fine fabric from the Bhir Mound, Taxila, has gadrooned sides, possibly part of a lotus pattern, and is unique (fig. 10, XVII).

This pottery was never abundant, but it occurs in relatively large quantities on sites in the Gangetic plain, in which must be located its main centres of dispersion. Consistently with this, at Taxila in the northern Punjab very extensive excavation has yielded only twenty fragments. The eighteen sites at present known to have produced the ware are as follows (map, fig. 11):—

1. Ahichchhatra, near Rāmnagar, District Bareilly (U.P.). Fig. 10, I–IV.
2. Mathurā (Muttra) (U.P.). Sherds found by Mr. Stuart Piggott.
3. Kauśāmbī, District Allahabad (U.P.). Fig. 10, V–VIII.
4. Bhīṭā, District Allahabad (U.P.).
5. Jhusi, District Allahabad (U.P.). A large and important city-mound on the bank of the Ganges opposite Allahabad. Several sherds of this fabric were picked up low down on the sides of the mound, but rain-wash and other disturbances render the evidence of level uncertain. Fig. 10, IX-X.
6. Masaon, District Ghāzipur (U.P.).
7. Atranji Kheḍā, District Etah (U.P.).
8. Sārnāth, District Benares (U.P.).

9. Rājghāṭ, on the northern outskirts of Benares (U.P.). Fig. 10, XII–XIV.
10. Patna (Bihar). A coarse and derivative example. Fig. 10, XI.
11. Rājgir, District Patna (Bihar).
12. Giriak, District Patna (Bihar). An extensive city-mound beside the Panchanā river beyond the north-eastern end of the range of hills in which old Rājgir is situated.
13. Bāngaḍh, District Dinājpur (Bengal).
14. Kasrāwadh, Indore State.
15. Bairāṭ, Jaipur State.
16. Sānchi, Bhopal State.
17. Taxila, District Rawalpindi (Punjab). Fig. 10, XV–XVII.
18. Buxar, District Shāhābād (Bihar). Sherds found by Mr. Baij Nath Puri.

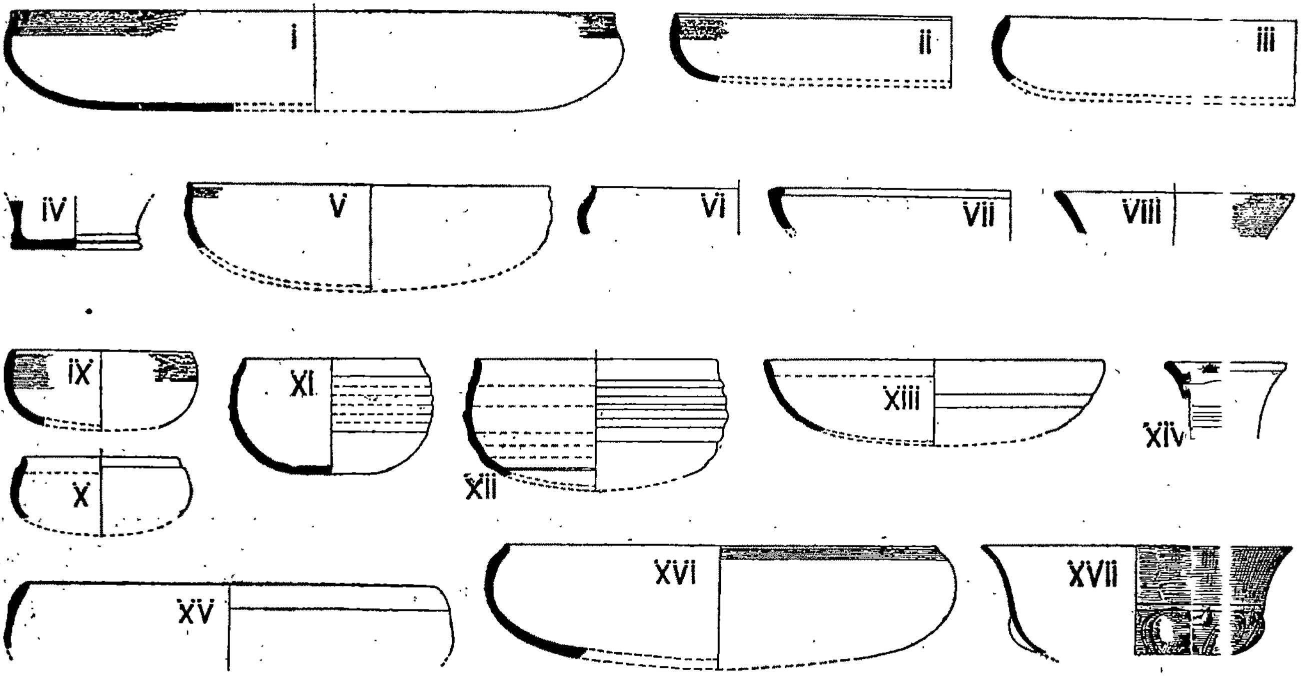

FIG. 10. *Northern black polished ware.* ¼ *I–IV, from Ahichchhatra; V–VIII, from Kauśāmbī; IX–X, from Jhusi; XI, from Patna; XII–XIV, from Rājghāṭ; XV–XVII, from Taxila (Bhir Mound)*

Although at certain of these sites the sherds were derived from deliberate excavations, the evidence as to date is usually unsatisfactory. For example, at Bhīṭā the records are insufficiently precise (see comments by Mr. K. de B. Codrington in *Man*, 1929, No. 101). At Ahichchhatra the lower levels, where the ware occurred, were inadequately explored. More significant evidence comes from Taxila. There two fragments only were found in the second city (Sirkap), established probably in the first half of the second century B.C.: one sherd at a depth of 18 feet below surface and therefore presumably of early date, the other sherd in a more doubtful context in a shallower site on the Hathiāl Ridge. The remaining sherds from Taxila, about eighteen in number, all came from the preceding city on the Bhir Mound. Here it is noteworthy that the larger number came from between 7 feet and 13 feet below the surface, only two fragments being higher than a depth of 7 feet (one at 4 feet 10 inches and one at 6 feet 2 inches). There is good evidence, particularly in the form of two hoards—see above, pp. 27ff., that the occupation-level at the average depth of 6 feet below the surface is approximately of 300 B.C., prior to which date the majority of the sherds must be placed.

At Taxila therefore the 'northern black polished ware' is mainly of pre-Greek period and cannot be ascribed, as has been suggested, to Greek influence. In origin it may well go back to the fifth century B.C., and it is unlikely to have survived later than the early part of the second century B.C.

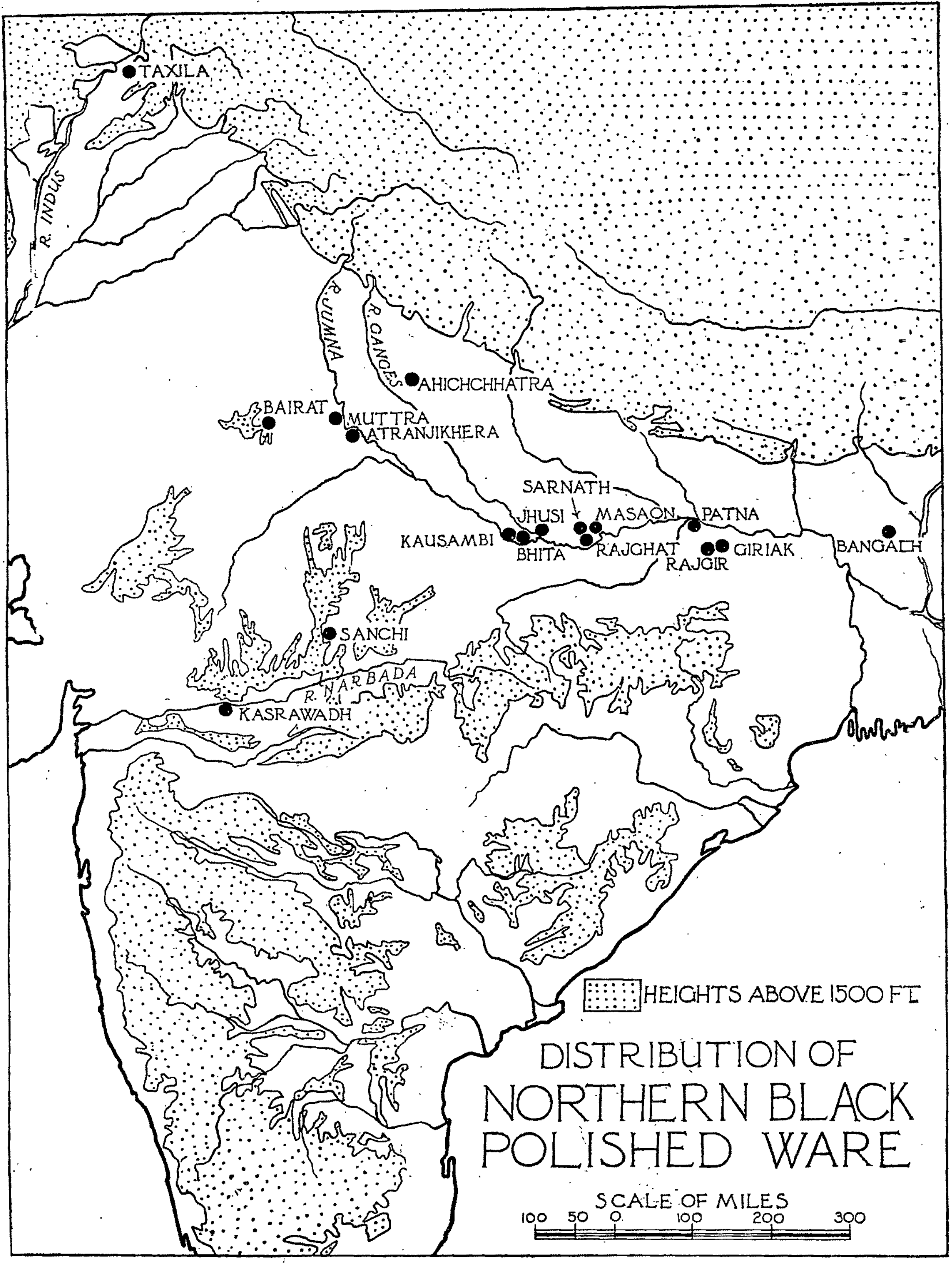

FIG. 11. NOTE: *add Buxar, on the Ganges between Rajghat and Patna*

The central points in time and space for the ware are thus (*a*) fourth century B.C., and (*b*) the Gangetic plain.

Report of the Archaeological Chemist

Khan Bahadur Mohd. Sana Ullah, Archaeological Chemist to the Archaeological Survey of India has twice reported on the processes involved in the production of N.B.P. ware. His reports are as follows:—

1. The black coating contains about 13% ferrous oxide which is responsible for the black shade. The original slip was evidently a highly ferruginous body (possibly consisting of a finely levigated mixture of clay and red ochre) ground in water and applied to the surface of the vessel before it was fired. The black colour was doubtlessly developed by the action of reducing gases formed in the kiln. The polishing might have been done before or after the firing. The coating is not a siliceous glaze.
2. The black polished film has been analyzed with the following results:—

   Silica, 46·55%; ferrous oxide, 25·20%; alumina, 15·53%; lime, 4·74%; magnesia, 3·43%; water (110°C.), 3·45%; alkalies not determined.

Fragments of the black pottery were heated in air over a bunsen burner with the result that they lost their black colour and gradually became light red. These fragments were again heated strongly in a glass tube while carbon monoxide was passed over them. This treatment changed their colour to black again. We have also succeeded in converting ordinary red and white pottery into black by heating with pieces of wood. There is no doubt therefore that the black colour is produced under reducing conditions and the red one under oxidizing ones in the kiln. Although Lucas has tried to prove that the black colour of pottery is due only to carbon, yet our experiments leave no doubt that ferrous silicate is also produced. Since ferrous silicate is said to be of blue-black colour, its share in colouring the body black is obvious. The presence of lime and magnesia further indicate that compound ferrous-lime and ferrous-magnesia silicates are also probably formed, which (being of low fusibility) bring about the fusion of the black film in the course of burning. That should account for the high polish and hardness of the surface of some of these specimens. I agree with Lucas that carbon is deposited in the pores of the pottery when a smoky atmosphere is created in the kiln by means of organic matter; but it is obvious that some tarry matter will also be produced and deposited in the pottery to enhance its black colour.

APPENDIX B

NOTE ON THE PAINTED GREY WARES AT AHICHCHHATRA (FIG. 12)

Painted grey vessels, mostly in the form of shallow bowls with flattened rims, grey core, brown surface inside and outside, and black lines on brown surface or brown lines on black surface, were recovered from the

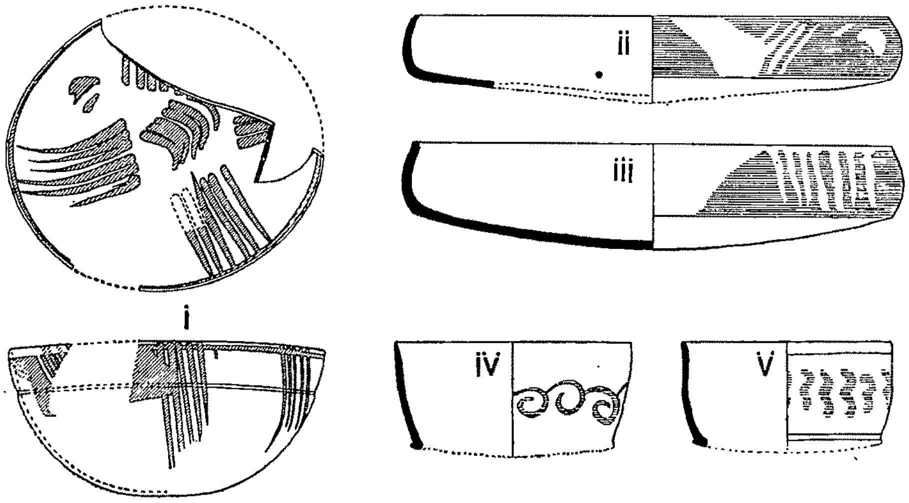

FIG. 12. *Painted grey wares.* ¼

lowest level in Plot AC XV at the easternmost end of the fortified area (fig. 12, ii, iii, v). Only two similar fragments, complete in section, were found in AC V from a layer (probably an earlier earthern rampart) below the foundation of the brick fortification (fig. 12, i, iv). This layer also contained a few 'northern black polished' sherds (see Appendix A). This fact tends to indicate that the painted wares and the black polished wares are coeval with each other. In Plot AC XV, however, they were not so. Here the polished sherds occurred in Stratum V, but were absent from the lower Strata VI, VII, and VIII. On the other hand, it was in the lowest of these levels that the painted wares were found. The areas excavated down to Strata V–VIII were, however, small and few, so that the priority of the painted to the black polished wares must be regarded as probable rather than proved. It is likely enough that the association of the black polished sherds with the painted wares in AC V was due to the heaping-up of mixed material to form the rampart. At the same time the possibility of an overlap between the two wares is slightly supported by their apparent concurrence in the hastily excavated lower levels of Rājghāṭ (Benares).

Fig. 12, (i) Fine-grained clay, grey core, polished on both sides, surface partly yellow-red and partly black-red, oblique dashes in yellow-red painted on exterior, traces of oblique dashes in light black paint on both faces of the centre piece.
(ii) Fine-grained clay, grey core, both sides of walls polished black-red surface with red patches, oblique dashes in red paint on walls outside and on the inside of the centre piece.
(iii) Fine-grained clay, grey core, both sides of walls polished, oblique dashes in light red paint on outside walls against grey-red ground.
(iv) Fine-grained clay, grey core, whitish grey surface, designs in black paint on outside walls.
(v) Fine-grained clay, grey core, whitish grey surface, designs in light black paint on outside walls.

‘ĀDILĀBĀD

A part of the ‘fourth’ Delhi

By Hilary Waddington

The successive cities of Delhi, seven or more in number, constitute the most remarkable series of medieval urban essays in the world, in consideration of their scale, their variety and their prestige. Nevertheless, of most of them very little is known, and there is no accurate plan even of their outline. A beginning has now at last been made to map and explore them, and the Assistant Superintendent in charge of the Delhi Circle of the Archaeological Survey of India here describes the initial excavation (1944-45) of the fortress of ‘Ādilābād which forms an outwork of Tughlaq’s city, commonly known as the fourth Delhi. This city, as large as the medieval city of London, was occupied for less than seven years, a fact which gives a special chronological value to objects found in stratigraphical association with it.

It is popularly supposed that there have been seven ancient cities of Delhi and that New Delhi makes the eighth.[1] This is an arbitrary statement and depends on just what is meant by a city. If we mean a centre of government, which until recently implied the residence of the emperor and his court, then we know of something like fifteen Delhis.[2]

The Tughlaqābād group, of which ‘Ādilābād is a part, is conventionally the fourth Delhi. It lies on the Mahraulī (Quṭb)-Badarpūr road, about 12 miles from Delhi.[3] It was founded by the Emperor Ghiāthuddīn Tughlaq as his capital in A.D. 1321, completed by 1323, and deserted by order of his son, Muḥammad bin Tughlaq, in 1327.

Historical Summary

Ghiāthuddīn seems to have been of Turkish extraction[4] and rose to be a commanding officer. He was appointed Governor of Debalpur.[5] After Nāṣiruddīn Khusrū Khān had murdered Quṭbuddīn in A.D. 1321 he sent robes of honour to the provincial governors, all of whom except Ghiāthuddīn put them on, an act by which they ranged themselves on the side of the new emperor.

Nāṣiruddīn sent an army against the defaulting Ghiāthuddīn but not only was this defeated but a subsequent expedition also was routed and the emperor’s brother put to

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[1] See, *inter alia*, G. Hearn, *The Seven Cities of Delhi* (London, 1928).

[2] Some of these Delhis, in approximately chronological order, are as follows: Indrapat (possibly the mound upon which Purāna Qila’ is now built), the area to the east of Sūraj Kuṇḍ, Qila’ Rāi Pithūrā or Lāl Kot, Kilokhrī, Sirī, Tughlaqābād, Jahānpanāh, Koṭla Fīroz Shāh, Khizrābād, Mubārakābād, Purāna Qila’, the city of which Sher Shāh’s Gate is one of the entrances, Shāhjahānābād (the present Delhi-within-the-Walls and the Red Fort), Civil Lines, New Delhi. But some of these can hardly have been more than villages in size.

[3] The Tughlaqābād group lies between 28° 30′ and 28° 32′ North and 77° 15′ and 77° 17′ East.

[4] There is no contemporary family history of the early Tughlaqs but Firishta made enquiries in the early seventeenth century A.D. See J. Briggs, *History of the Rise of the Mahomedan Power in India*, translated from the Persian of Mahomed Kāsim Firishta (London, 1829), I, 401.

[5] Debalpūr or Dīpālpūr, in the Montgomery District of the Punjab, and afterwards a favourite place of residence of Fīroz Shah Tughlaq.

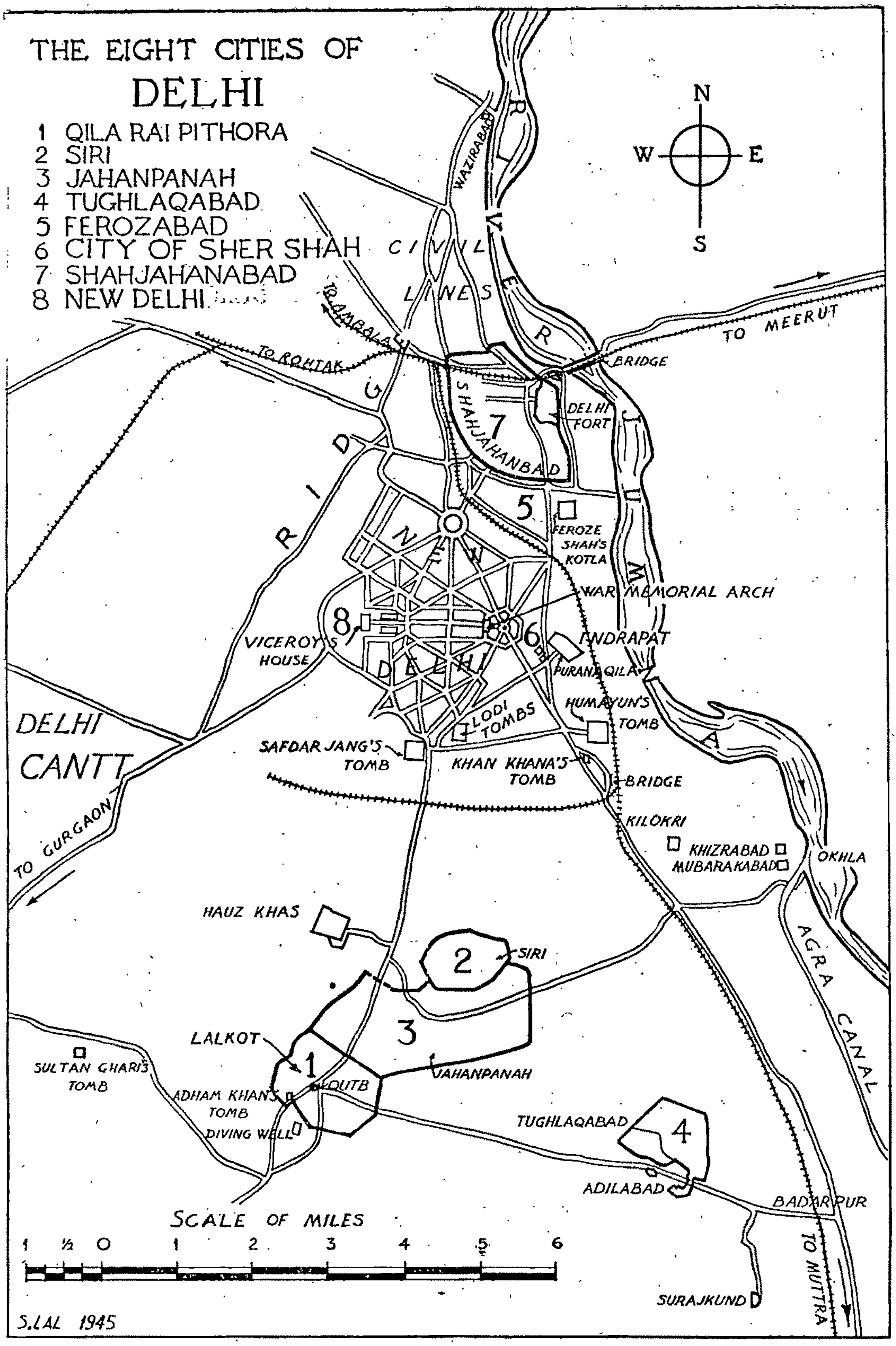
THE EIGHT CITIES OF
DELHI
1 QILA RAI PITHORA
2 SIRI
3 JAHANPANAH
4 TUGHLAQABAD
5 FEROZABAD
6 CITY OF SHER SHAH
7 SHAHJAHANABAD
8 NEW DELHI
N
W
E
S
RIVER JUMNA
WAZIRABAD
CIVIL LINES
TO AMBALA
TO ROHTAK
TO MEERUT
BRIDGE
RIDGE
SHAHJAHANABAD
DELHI FORT
FEROZE SHAH'S KOTLA
WAR MEMORIAL ARCH
INDRAPAT
NEW DELHI
VICEROY'S HOUSE
PURANA QILA
HUMAYUN'S TOMB
LODI TOMBS
SAFDAR JANG'S TOMB
KHAN KHANA'S TOMB
BRIDGE
DELHI CANTT
TO GURGAON
KILOKRI
KHIZRABAD
MUBARAKABAD
OKHLA
AGRA CANAL
HAUZ KHAS
SIRI
LALKOT
JAHANPANAH
SULTAN GHARI'S TOMB
ADHAM KHAN'S TOMB
QUTB
DIVING WELL
TUGHLAQABAD
ADILABAD
BADARPUR
TO MUTTRA
SURAJKUND
SCALE OF MILES
1 ½ 0 1 2 3 4 5 6
S. LAL 1945

FIG. 1

death. Ghiāthuddīn then killed Nāṣiruddīn after he had reigned only five months, and seized the empire.

Associated with Ghiāthuddīn was his son, Muḥammad bin Tughlaq, who had become Master of the Horse at Delhi. With the pick of the Imperial Horse, he deserted to his father when the latter defied Nāṣiruddīn.[6]

Ghiāthuddīn Tughlaq, in common with many rulers both before and after, decided when he came to the throne that he would build a new Delhi which should bear his name. So he selected a site on the edge of the rocky country about five miles to the east of the old city of Lāl Koṭ (now part of Mahraulī, where the Quṭb Mīnār stands) and he started at once to build (A.D. 1321).

While Tughlaqābād was building, the famous Muslim saint, Shaikh Niẓāmuddīn Auliā, who lived some six miles away to the north at Niẓāmuddīn, was also doing some building and, as all the labour had been press-ganged into the work at Tughlaqābād, he was held up. He sent to the emperor asking that labour be released for him, as he was building to the glory of Allāh. The emperor refused, so the saint put a curse on him.

In A.D. 1323 Ghiāthuddīn went on an expedition to Bengal, and some time later when returning victorious he was met by his son Muḥammad whom he had left in charge of Tughlaqābād. His son asked him to postpone his entry into the new city until the next day as festivities and an elephant fight had been arranged.[7] There are several versions of the story of the subsequent collapse of the pavilion and the death of Ghiāthuddīn. But the curse of the saint was fulfilled and Ghiāthuddīn never lived to enter his new city. These were unsettled times and a ruler could expect trouble both from within and without; in fact it is doubtful if any crowned head at this period died a wholly natural death.

Of Muḥammad bin Tughlaq, Ibn-i-Baṭṭūṭa says, 'This king is of all men the fondest of making gifts and of shedding blood',[8] but there is perhaps more controversy about Muḥammad bin Tughlaq than about any of the other emperors of this time. He is by some considered as a 'cruel tyrant' but by others as a misunderstood, advanced idealist. He was certainly cursed with a violent temper. The inhabitants of his father's city of Tughlaqābād, having incurred his displeasure, were all forced to evacuate the town and go to Daulatābād in the Deccan, and the subsequent desolation of the capital is described by Ibn-i-Baṭṭūṭa.[9] In the earlier part of his reign the empire held together fairly well but, owing to its size, insurrections were apt to break out in various parts and, at his death at Thaṭṭa on the lower Indus, his successor and cousin, Fīroz, had some difficulty in returning with the army to Delhi. It is interesting to note that one of the first things that Fīroz Shāh did when he succeeded Muḥammad bin Tughlaq was to obtain a deed of forgiveness from all persons who had been wronged or whose relations had been executed by him. These deeds he placed beside Muḥammad's grave in the hope that he would not suffer unduly in the hereafter.[10]

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[6] For much of the contemporary data of this and the succeeding reign we are indebted to the account of his journeyings left by the Arab geographer Ibn-i-Baṭṭūṭa (ed. S. Lee, London, 1829; and H. A. R. Gibb, London, 1929).

[7] The venue of this incident was 'Afghānpūr', but it has not been identified.

[8] Gibb's *Ibn Batuta*, p. 197.

[9] *Ibid.*, p. 204. It seems to the writer that Tughlaqābād and not Jahānpanāh is referred to in this passage.

[10] H. M. Elliot, *History of India as told by its own Historians* (London, 1871), III, 385-6.

From the numismatic point of view Muḥammad bin Tughlaq's reign is richer than almost any other of the medieval period.[11]

The Tughlaqābād group of Fortifications

The Tughlaqābād group consists of the walled city (including the town, the palace and the citadel), Ghiāthuddīn's Tomb (pl. XIII) and 'Ādilābād; as well as the Barber's Fort, a number of *bunds* or dams and waterworks, and scattered suburbs and tombs in the neighbouring countryside.

The little Barber's Fort to the east is also known as the Washerman's Fort and the Emperor's Fort, and it seems probable that this was built first, as a place in which Ghiāthuddīn or his son could live while the main town and fort were being built.

It is said that Tughlaqābād was built in two years—a colossal achievement even at a time when labour could easily be obtained by conquest.[12] The town is in area some 300

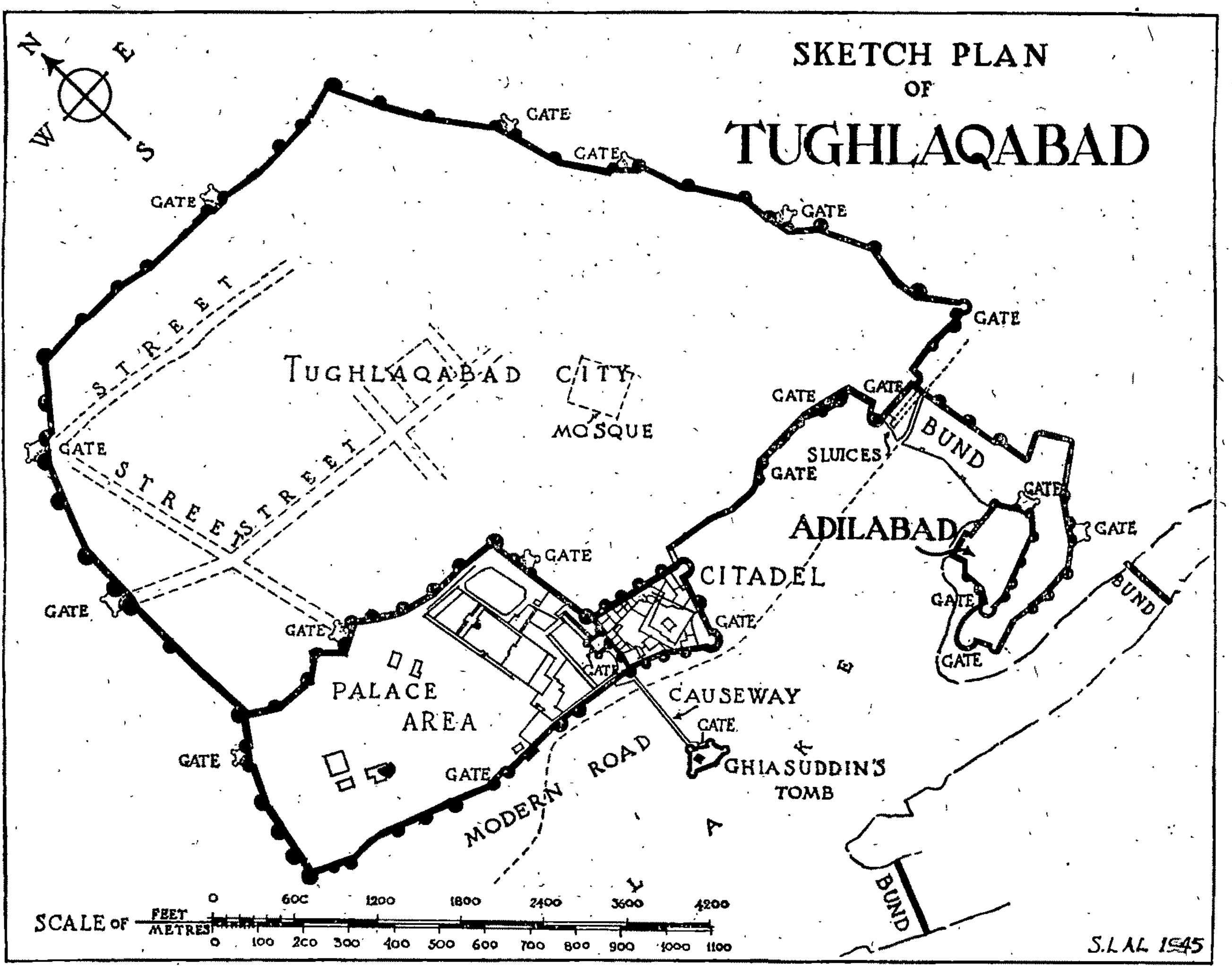

FIG. 2

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[11] E. Thomas, *Chronicles of the Pathan Kings of Delhi* (London, 1871), p. 206, calls him 'a Prince of Moneyers'.

[12] Was this the reason behind the Bengal expedition? Was labour getting scarce round Delhi?

acres, about the same as the city of London, and is enclosed by great walls 30 feet to [illegible]0 feet high, with bastions and gates at intervals.

Inside each gate is a group of four, six or eight circular chambers about 2[illegible] feet in diameter and 30 feet deep, which seem to have been grain silos,[13] and there is a well-defined grid-plan for the roads, which run from gate to gate and were probably lined with trees (pl. XII).

On the south-west part of the site, and surrounded and cut off from the town by a larger wall, is the Royal or Palace quarter containing the remains of some big buildings, and to the east of this quarter is the citadel cut off from the palace by an even greater wall which in parts still stands to a height of about 90 feet. There are two big *bāolīs* or step-wells, one in the Palace quarter and one in the citadel, which it would be interesting to clear out and repair, although it would be a dangerous and expensive undertaking.

Not feeling wholly secure in his citadel the emperor seems to have built a strong defence-wall dividing the central keep from the rest of the citadel, and it is from within this central area that, in a small cellar in the floor of a not very important room, a staircase leads down, complete with grooves to take a false floor to cover its top end, to a little escape door which, when the 'glacis' or sloped covering of the base of the wall was still in place, opened into the rough rocks outside the Fort in such a way that it would not be noticeable to anyone who did not know of its existence. The original stone door-leaves are still in position and can be pushed open with an effort.

From the citadel is a fortified passage supported on arches leading to the tomb of Ghiāth-uddīn. This tomb is itself a small fort and is provided with two grain silos, and a very good well on the far side from the citadel. It originally stood out in the lake, more than a bow-shot from the citadel, and it can be surmised that when he built his tomb, Ghiāthuddīn had in mind its possible use as a refuge.

Connected with Tughlaqābād town by a causeway (which was also a dam to hold up the water in the lake that lay over the whole of what are now fields to the south of the citadel) is the subsidiary fort of 'Ādilābād (pl. XI) where Muḥammad, Ghiāthuddīn's son built a palace and lived.[14]

In addition to the layout of the streets and compounds of the city many other details can be made out from the air. Outside the east wall of the city is a large suburb of which the walling, once it has been recognized, can easily be picked up on the ground. On the rough country to the south-east of 'Ādilābād is another suburb stretching away towards the tank known as Sūraj Kuṇḍ, about two miles away.

'ĀDILĀBĀD

Of 'Ādilābād itself the first part to be built seems to have been the main walling round the rocky outcrop which forms the upper ward. It hardly seems fitting to call this upper ward the 'keep' as this term implies a smaller structure which, at any rate in the European and Near Eastern Castles, was usually roofed over.

The style of this main walling is identical with that of the town walls of Tughlaqābād on the other side of the lake, but they are not so massive as those of the citadel which have both an upper and a lower parapet walk in addition to the *chemin-de-ronde*.

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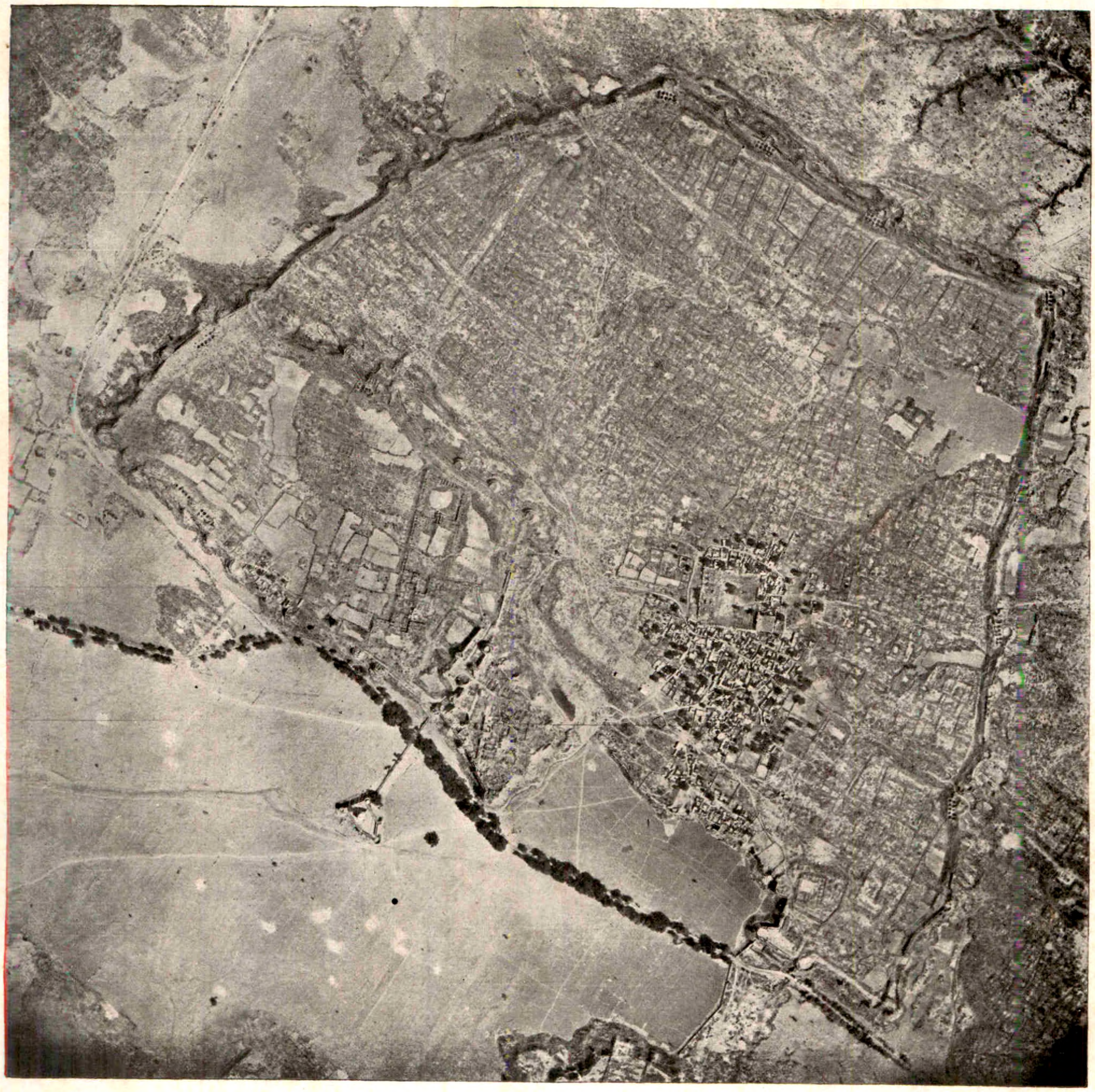
[13] Ibn-i-Baṭṭūṭa mentions that grain was kept in store here for years, but, although black, tasted good and fresh.

[14] Syed Ahmad Khan, *Asar-ī-Sanatīd* (Delhi, 1848), p. 14, citing Badrichāch, a court-poet of Muḥammad Tughlaq.

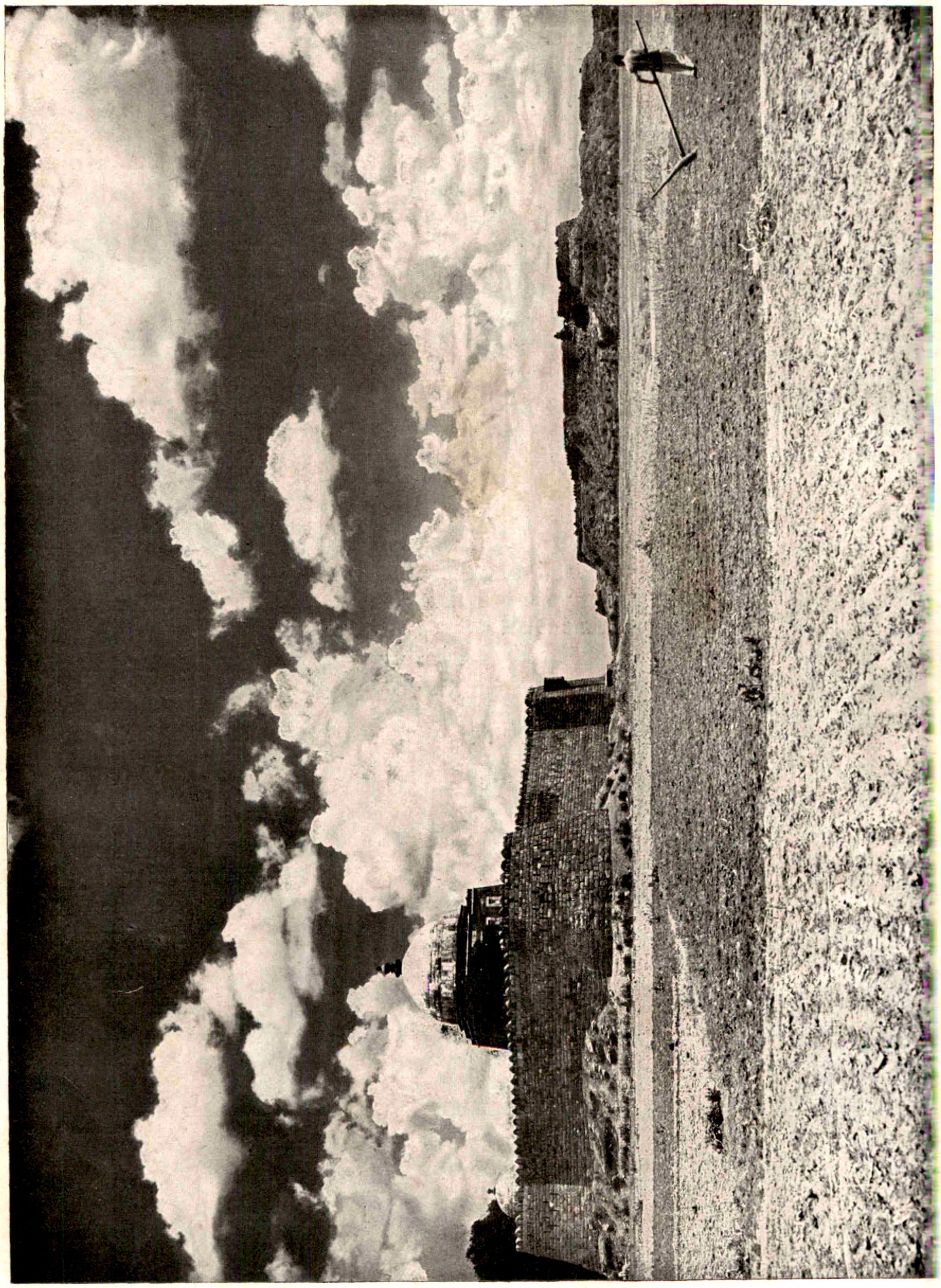


Royal Air Force

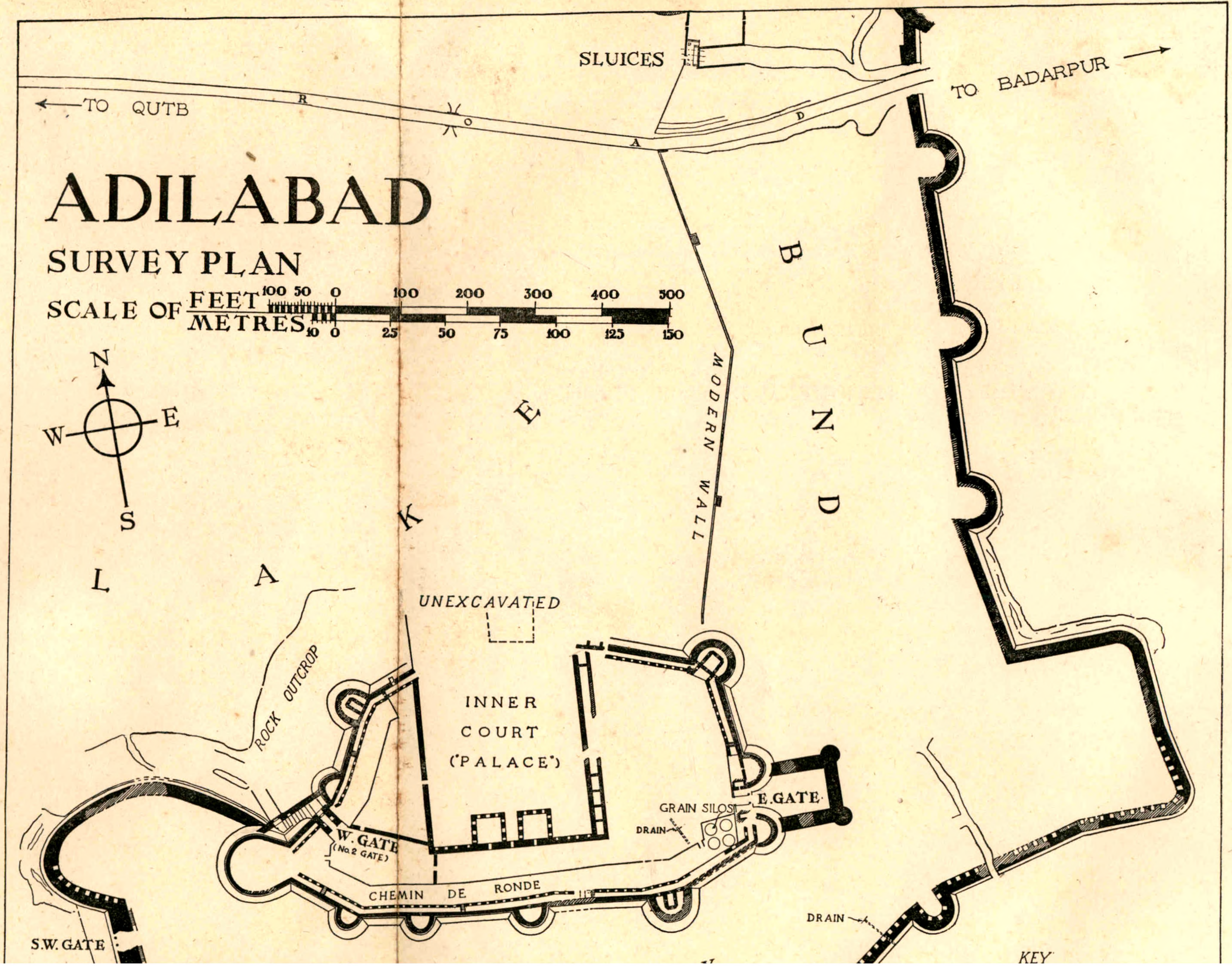
Tughlaqābād from the air, showing the outlines of the fourteenth-century streets and buildings, now mostly buried. Modern village near bottom corner.

PLATE XII

To face page 65



The tomb of G͟hiāt͟huddīn Tug͟hlaq, left, and ʻĀdilābād in the distance.


ADILABAD
SURVEY PLAN
SCALE OF FEET / METRES
100 50 0 100 200 300 400 500
10 0 25 50 75 100 125 150
N
E
W
S
SLUICES
TO QUTB
ROAD
TO BADARPUR
MODERN WALL
BUND
LAKE
UNEXCAVATED
ROCK OUTCROP
INNER COURT ('PALACE')
E. GATE
GRAIN SILOS
DRAIN
W. GATE (No 2 GATE)
CHEMIN DE RONDE
S.W. GATE
DRAIN
KEY

In parts these walls are capped with half-round coping stones and elsewhere—at a higher relative level—with *kangura* or merlons. This coping is best preserved on the main west bastion where the floor-level inside the parapet is the same as that of the *chemin-de-ronde*. The roof of the latter, which forms the parapet walk of the higher parts of the main walls where they are topped with *kangura*, was supported on wooden rafters, the socket holes for which can be clearly seen. In this respect this roofing differs from the roofing of the *chemin-de-ronde* of the bastions of Tughlaqābād where a barrel vault is used.[15] There is no direct evidence that the floor above was of wood and no fallen stone slabs have been found on the floor beneath. It seems probable therefore that this flooring, which was exposed to the weather, was of tamped earth, probably the local *bajrī* (see below, p. 71) laid either on boards, branches or faggots, which in turn rested on the rafters, which must have been fairly closely spaced for their size. Their sockets are about 6 inches by 9 inches and average 34 inches from centre to centre, the span being about 8 feet. A very similar type of roof was found in a castle only a few years earlier in date at ʻAthlīt in Palestine, where the lack of big timbers and expense of vaulting necessitated some other form of roofing.[16]

The second stage in the building was to plant a convex glacis against the lower part of these main walls. This glacis seems to have been added for three reasons: first to buttress the walls; secondly to protect their base on the friable rock against mines or saps; and thirdly to fill up, and so keep the enemy out of, the 'dead ground' at the foot of the wall.[17]

The third stage in the building was the addition of the curtain wall between the main west bastion and the next bastion on the north-east. This curtain wall contains the lower north-west gate (No. 2 gate) and is in front of that part of the main wall which contains the upper north-west gate. The bailey wall was built at the same time, as this and the curtain wall bond in at the angle where they meet each other and the main west bastion.

The fourth stage was the building of the stepped ramp between the upper and lower gates. This is of roughly dressed slabs laid on an infilling between the two walls. The infilling is very loosely packed stone with less than the minimum of poor quality lime concrete, so that it is full of cavities and hollows.

The fifth stage, which was probably contemporaneous with the fourth, was the building of a glacis against the bailey wall, followed almost immediately by the construction of the packed stone and *bajrī* ramp up to the lower gate. Even so there was a four-foot step up to the threshold of the gate from the top of the ramp.

The sixth stage was the addition of barbicans outside the two gates into the bailey, one on the south-east which is very well preserved and which has a curious piece of conical vaulting above the inside of the outer gateway, and the other on the west where the plan is almost entirely obscured by falls which will have to be cleared. These barbicans have not, however, been studied in any great detail as yet.

The foregoing six stages are really all of one period and style, i.e., the walls are of dressed local stone in carefully built coursed ashlar on the outside face, and random rubble, plastered at the joints and over the smaller stones, on the inside face, and the infilling consists of smaller stones in lime concrete into which was mixed a large quantity of pounded brick and broken pottery.

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[15] It seems that where the *chemin-de-ronde* is a series of straight or nearly straight runs, there a timber roof was used. If, however, the passage was built on a fairly acute corner, then the spacing of the rafters would be too close on the inside and too wide on the outside, so a vaulted roof was used.

[16] *Quarterly of the Department of Antiquities in Palestine* (*Q.D.A.P.*), V, 'Excavations at Pilgrim's Castle, ʻAthlīt (1932-33)', pp. 33-4.

[17] The 'bolster plinth' or convex glacis was already an ancient tradition in India. It occurs on the town-walls of the latest or Kushāna city of Taxila (Sirsuk) in the Punjab in the second century A.D.

The false pointing on the plaster which covered the joints on the inner face of the walls seems to have been painted white. There is evidence of this in the débris on the terrace just inside the lower No. 2 gate, and on some of the plaster still *in situ* on some of the lower joints of the glacis of the main wall at this point.

The seventh stage seems to have been to build the so-called 'palace' in the middle of the upper ward. The masonry of this building is roughly coursed random rubble which was in all probability plastered on both sides. As a palace, the plan leaves much to be desired; indeed there are only two rooms with a corridor between them, and the great enclosed courtyard which may possibly have been the 'Hazār Sutūn' or Hall of a Thousand Pillars to which Ibn-i-Baṭṭūṭa refers.[18]

The eighth stage is the building, inside the lower gateway against the glacis of the main walls and partly on the upper ramp, of a narrow terrace about 4 feet 6 inches high. The only use to which it could be put seems to be for door-keepers, peons and such-like to sit and sleep on, and this is confirmed by Ibn-i-Baṭṭūṭa.[19]

A final or what might be called a ninth stage is represented by a squatters' level and wall inside the upper gate subsequent to the collapse of a part of the latter. To judge by the associated finds, which include a coin of Muḥammad bin Tughlaq of about 1344 A.D., found in the occupation layer on the floor, this collapse must have been very soon after the final abandonment of this group of monuments.

The above gives a general picture of the way in which 'Ādilābād Fort came to be built. The work of 1944-45 was concentrated on two things, the clearing and elucidation of the north-west gateway and the collection of material for a study of the pottery of this period.

THE NORTH-WEST GATE (NO. 2. GATE)

(Figs. 3-4, pls. XIV–XVIII)

Assuming that the visitor and his elephant had by some means overcome the inherent difficulties of crossing the several hundred yards of lake, they would find themselves at the foot of an earthen ramp running up from the water's edge beside the glacis against the bailey wall. Turning half right (at a point missing when the excavations started but now replaced) this ramp runs up to the lower gateway. It seems to have been laid down on a slightly earlier one which was some three feet lower. How the inhabitants got from this ramp into the gate is not known as the sill is about 4 feet above the top of the ramp. There may have been a wooden stair which could be moved inside in the event of an attack.

The lower gate is built in the curtain wall between the outer parts of the main west bastion and the next bastion along the north-west side of the Fort. This gate follows the

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[18] Ibn-i-Baṭṭūṭa, while giving us countless glimpses into the lives and character and the doings of the court at Delhi is tantalizingly vague in describing places. In Gibb's translation he tells us (p. 197) that 'the Sultan's palace at Delhi is called Dar Sara, and contains many doors'. But he does not say just where, in the four towns, Lāl Koṭ, Sirī, Tughlaqābād and Jahānpanāh which at that time comprised the capital, the palace was situated. The site dug in 1930 by the late Conservation Assistant of this Department, Mr. M. P. Varma, at Bijai Mandal (*Annual Report of the Archaeological Survey* 1930–34, p. 146 et seq.) may or may not be the Hall of a Thousand Pillars. Muḥammad certainly could not see the city of Tughlaqābād from the roof of the building at Begampūr but he could from the roof of the 'palace' in 'Ādilābād.

[19] Op. cit., p. 198.

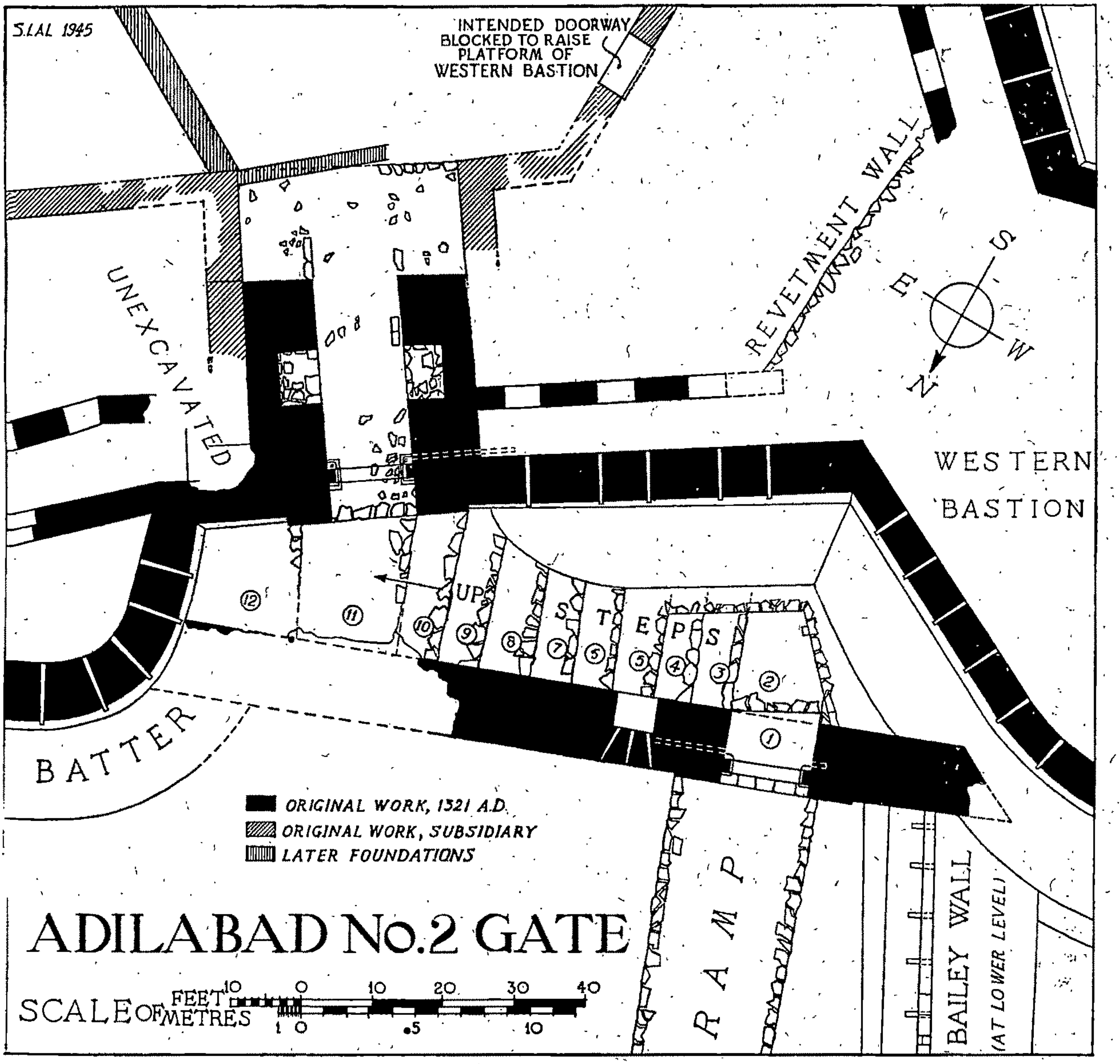

FIG. 3

usual pattern and would have been fitted with massive wooden doors,[20] probably plated with iron sheets on the outside and studded with spikes at the level of an elephant's head to prevent those animals, the tank of that time, from being brought up to push in the doors.

Doors of this type have persisted in India right up to the middle of the last century. The weight of the door is taken on an iron pin which bears on a steel socket let into a projection at the inside of the bottom of the jambs, while at the top of the door the side member is carried up and provided with an iron collar which fits into a circular hole in a stone built to take it.

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[20] Probably never actually fitted, since the hinge-stones bear no signs of sockets.

To close these doors there would normally be large chains and hasps, but in addition to this a wooden draw-bar a few feet longer than the greatest width of the gateway was built into the wall.[21]

This outer or lower gate was guarded by arrow slits in the bailey wall alongside, which could bring cross-fire to bear on any one trying to break in the doors and from a close range of about ten yards. It was also protected by three arrow-slits opening from a small guard-room a few steps up the inner ramp in the thickness of the curtain wall. In addition the whole approach up the lower ramp was exposed to cross-fire from the bailey wall.

Inside the curtain wall, the ramp connecting the lower and upper gates is stepped and is of the type which has been termed 'elephant ramp'. The steps here vary in size but average 6 feet 4 inches wide and the vertical riser is about 3 inches. It is very doubtful if an elephant could ever have used it because it is so steep that, although the animal might have managed to go up it, it would have been very difficult for it to have come down again. Also both gates are so low [22] that an elephant with a covered howdah would almost certainly have got jammed.[23]

Of the upper gate all that now remains are the well-chiselled door jambs with double corbels and a huge lintel block above (pl. XVIII). The whole design of this work is not

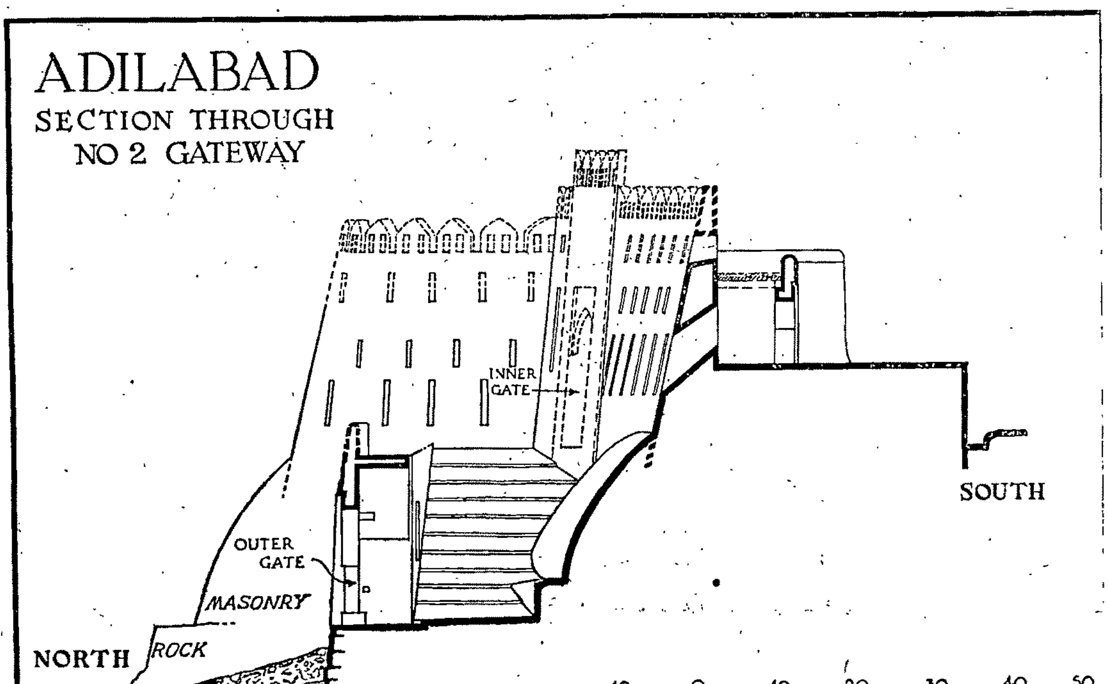

FIG. 4

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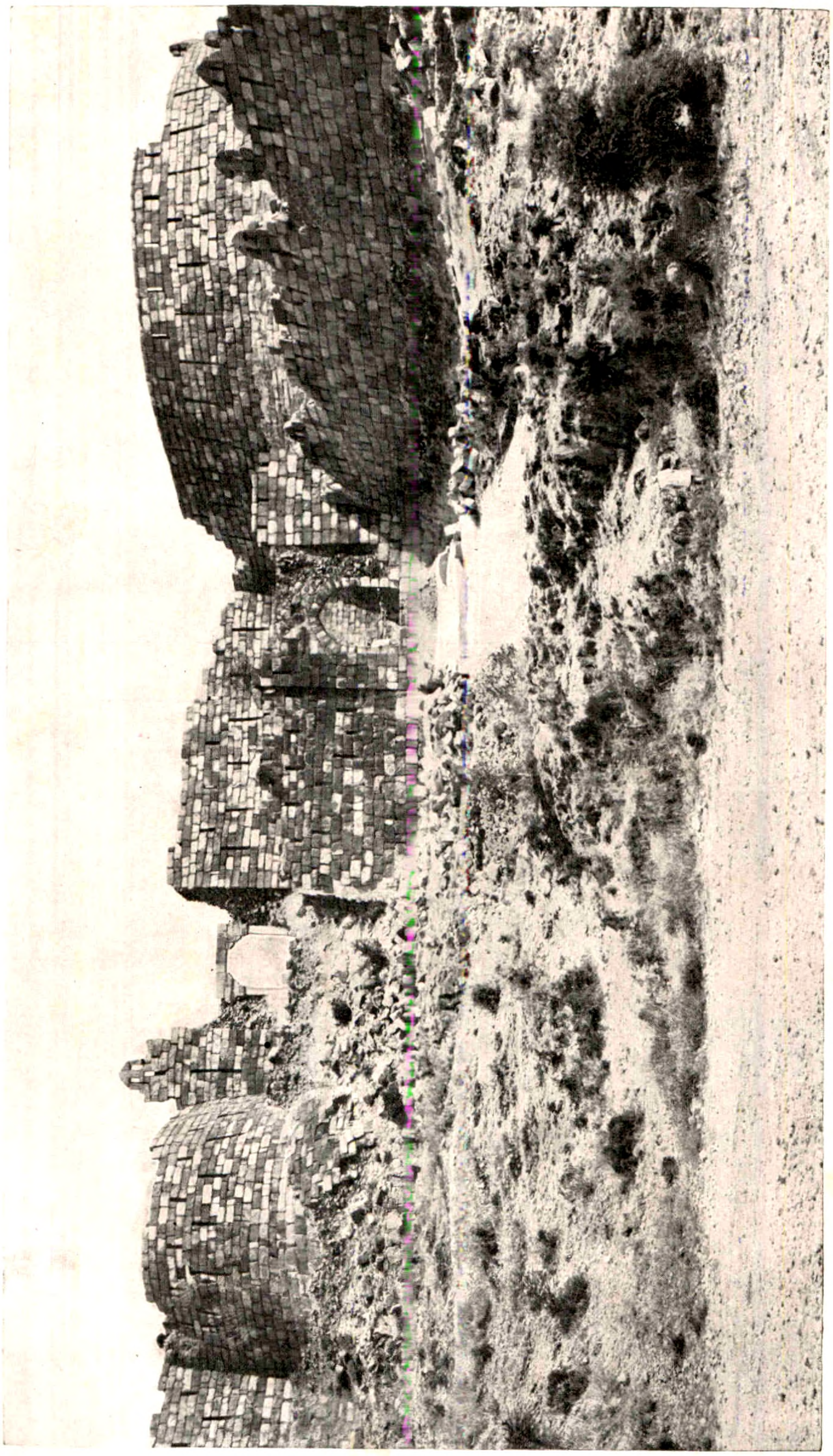
[21] The size of the draw-bar hole in the south-western jamb of the gate is 6 inches high by 6½ inches wide and the bottom of this hole is 4 feet 3 inches from the sill.

[22] Lower gate 7 feet 4 inches to springing and 13 feet 11 inches to the crown of the arch, upper gate 1[illegible] feet 3 inches from sill to top of cap and 13 feet 9 inches to underside of the lintel.

[23] An average elephant stands about 10 feet to the shoulder and a covered howdah would be about [illegible] feet above that, making 16 feet over all. Even allowing for elephants crouching, as they do, to get their back load under a branch or doorway, the minimum height of a doorway should be 15 feet.

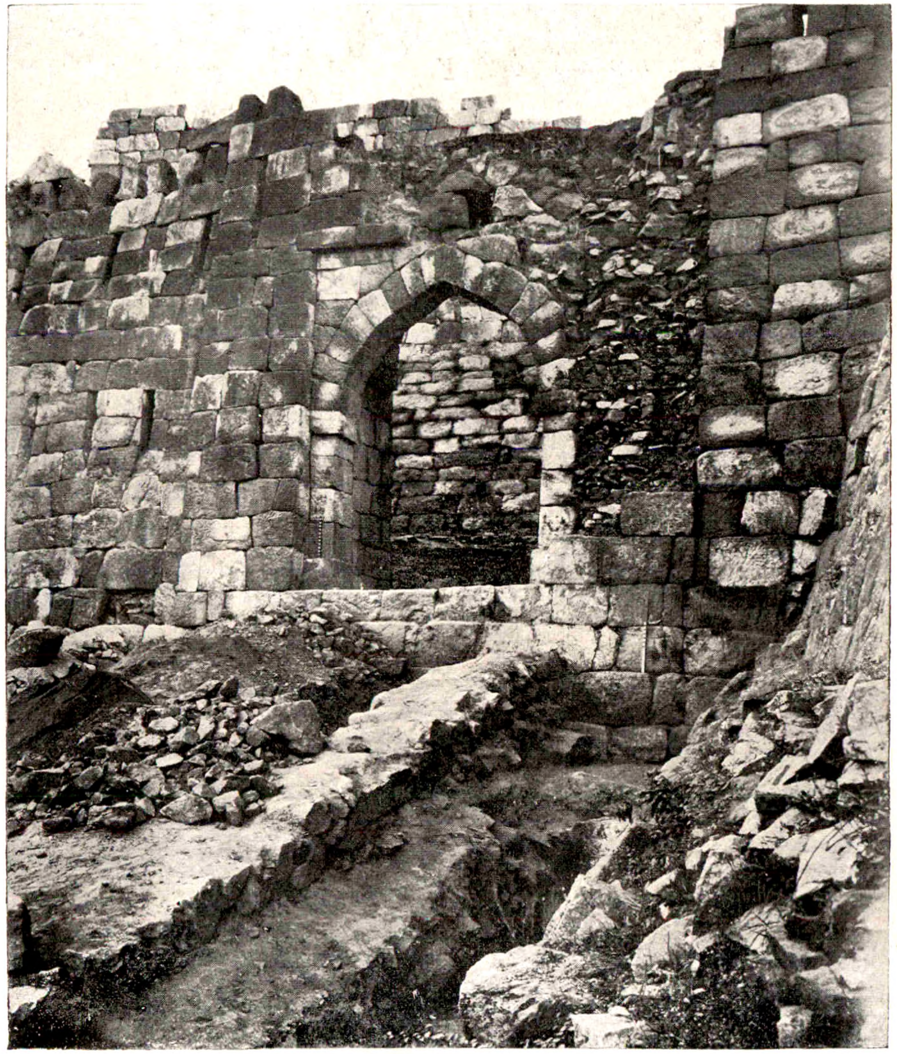
PLATE XIV



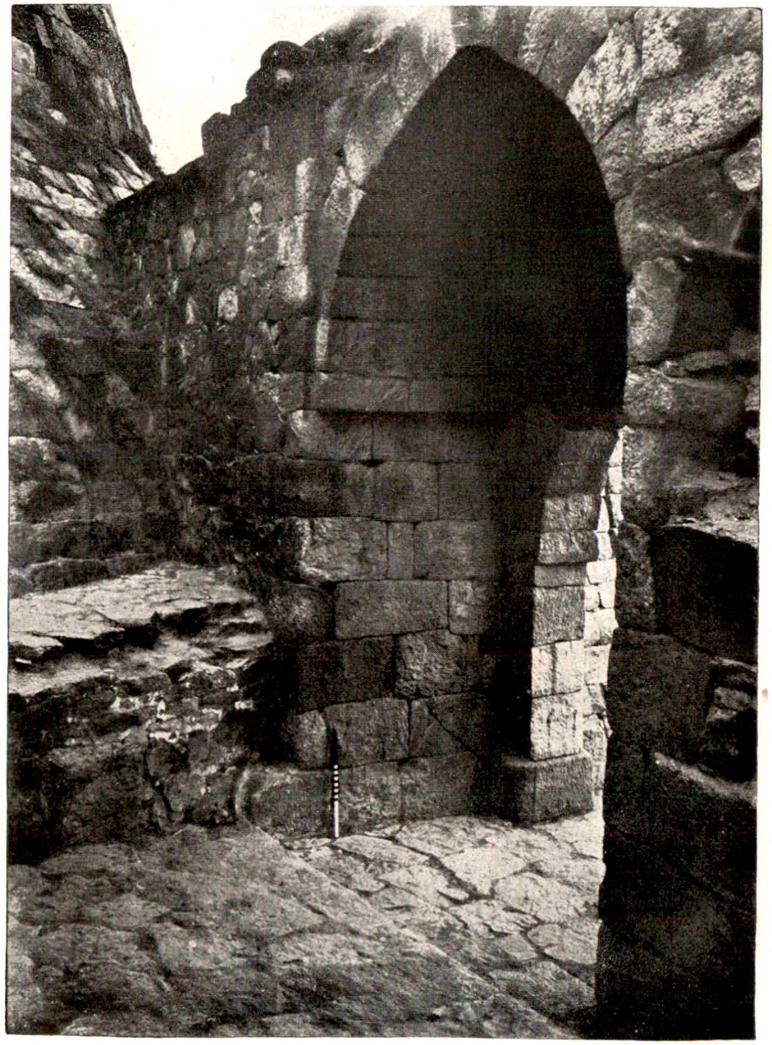
ʿĀdilābād, west entrance and flanking bastions; view from the flood-plain.

PLATE XV

To face Plate XVI



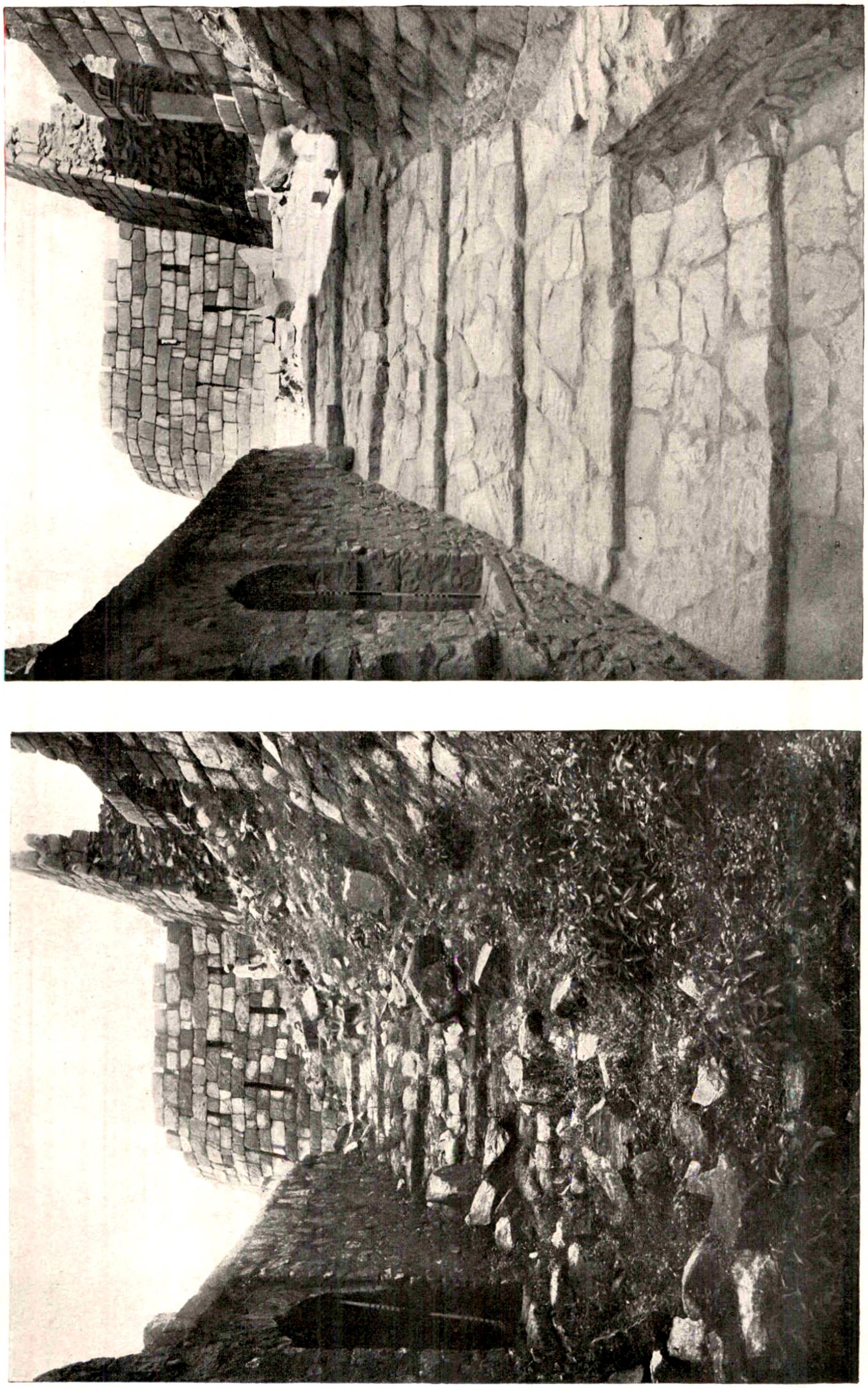
A. 'Ādilābād west gate, lower entrance, exterior.



B. 'Ādilābād west gate, lower entrance, interior.

To face Plate XV

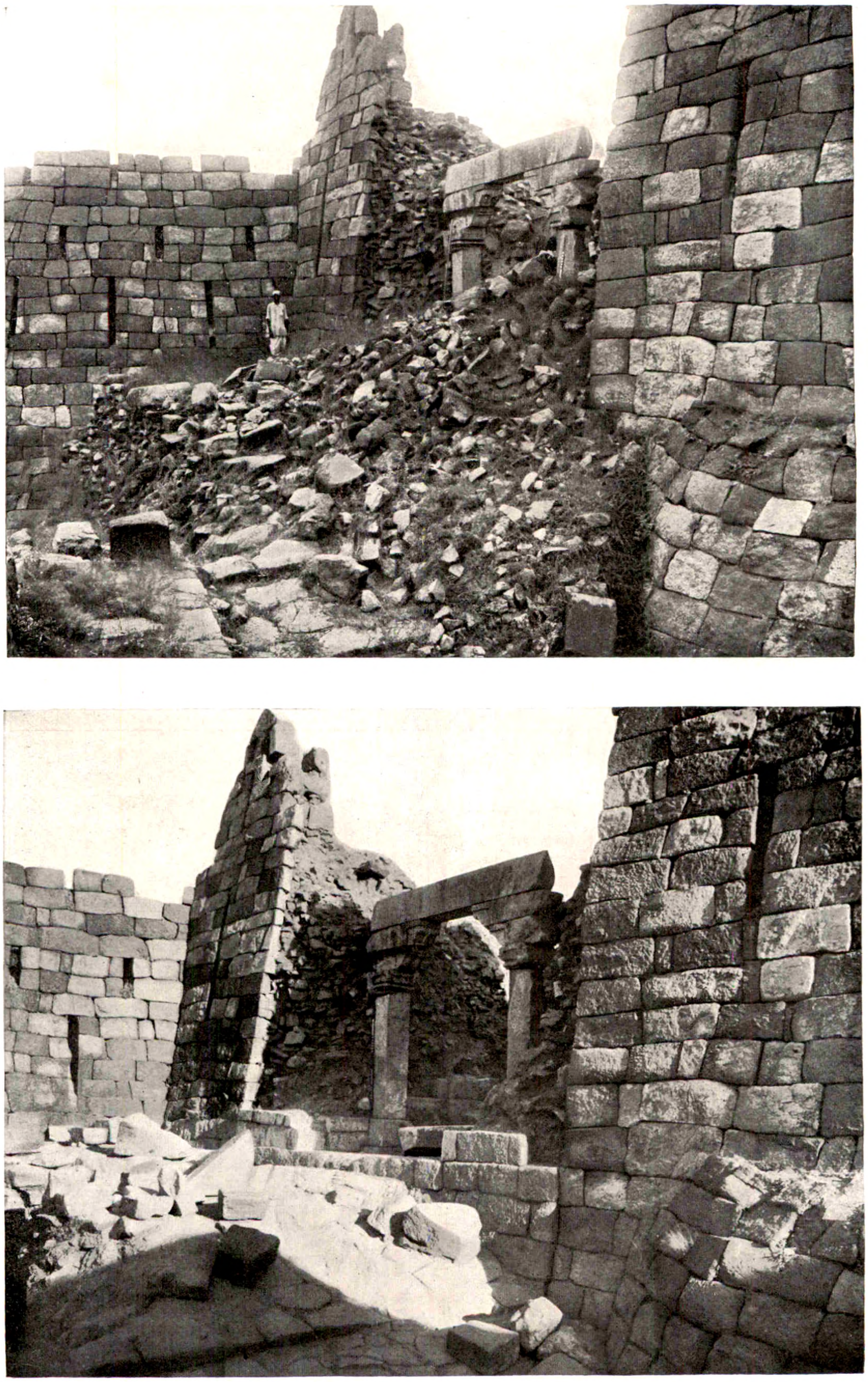
PLATE XVI



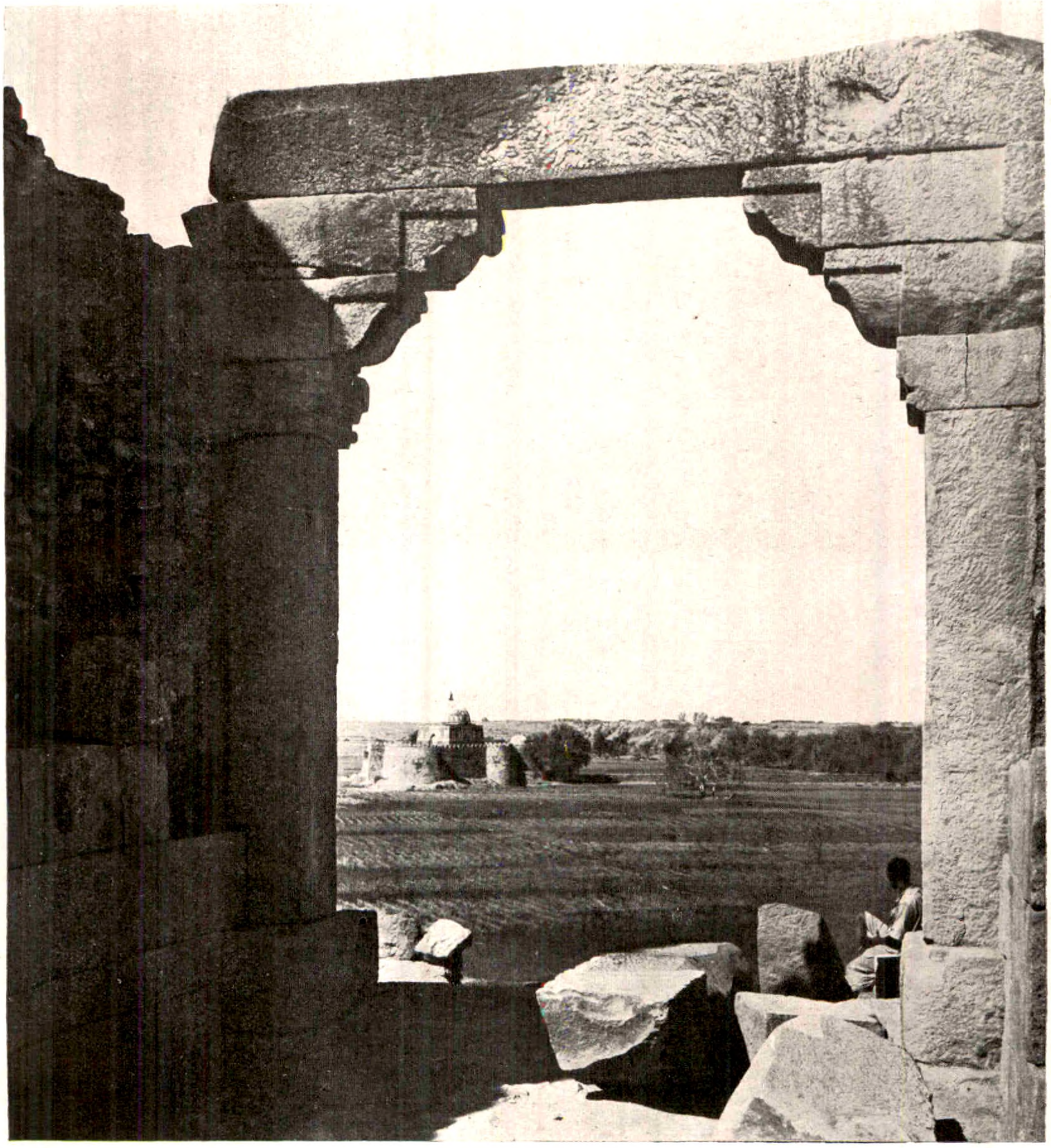
'Ādilābād west gate, 'Elephant Steps' before and after excavation, 1944.

PLATE XVII

To face Plate XVIII



'Ādilābād west gate, inner entrance before and after excavation.



ʻĀdilābād west gate, upper entrance, interior. The tomb of G͟hiāt͟huddīn Tug͟hlaq in the distance.

Moslem but Hindū, and this duality is paralleled in other parts of ‘Ādilābād as well as in various parts of Tughlaqābād. The construction is trabeated and is built dry, while Islamic work is arched, vaulted and laid in mortar.

There must have been an arch in front of this ‘Hindū’ gate, as voussoirs of too great a radius to have come from the guard-room vaults were found in the débris in the gateway. The inner part of this gateway must also have been vaulted.

Another lintel block was found in two pieces in the débris about 6 feet to 7 feet above the floor level and may have originally been superimposed on the lintel still *in situ*.

The workmanship of the upper gate is much better than that of the other parts of the Fort. This gate is built in finely dressed Delhi quartzite ashlar, as are the guard-rooms also. Delhi quartzite is a very hard stone and is not easily worked. It was in great favour, however, with Fīroz Shāh, the successor to Muḥammad bin Tughlaq.

There is evidence in a number of places of minor changes of design during the progress of the work. For example, the length of the arrow-slits in the west side of the bastion at the head of the ramp by the upper gate, and the length of the arrow-slit on the south-west of this gate, were originally larger and have been filled up at the bottom.[24] In the curtain wall there is a straight joint near the top of the ramp on the inside and on the outside at this point are three filled-in arrow-slits of much the same pattern and spacing as those in the existing guard-room just inside this outer gateway.

SOUNDINGS

During the course of the work a number of soundings were made to clear up various obscure points. These are listed below in the order in which they were made, and their position can be seen from the key plan (fig. 5).

Trench I, sunk in the outer ramp to see if there were any previous work or if it could be ascertained how the roadway approached the gate. Rock was found at 8 feet below the sill of the gate, and at a distance of 10 feet on plan from the face of the wall (and 9 feet below the sill level) was a rough step about 8 inches high of rough stones laid dry running diagonally to the line of the wall. This may be part of a builder’s ramp to assist work in progress.

Trench II, just inside the upper ward proper, from the south-west angle of the terrace-retaining-wall along the inside of this wall, to clear the line of the wall.

Trench III was originally cut across half the width of the opening or ‘doorway’ in the terrace-retaining-wall, and leading from the upper ward to the main west bastion, and was taken down on the inside of the wall to see what the foundations were like. At 2 feet 3 inches below the sill of the opening is an offset and the bottom of the wall is 6 feet below the sill. This trench was cut through packed *bajrī* which was laid all at the same time.

Trench IV, cut alongside the lower ramp outside the lower gate and parallel to Trench I but on the eastern side of the ramp, to see if the step in Trench I could be picked up, and to examine the rough dry-stone walling which has been used at this point to support the side of the ramp. The step could not be traced.

The area between the south side of the upper gateway and the ‘Squatters’ wall’ and the returns of the rubble-retaining-walls of the terrace seems to have been occupied as a living quarter at some time very shortly after the place was abandoned. During clearance this area was at first divided up into several parts which can most easily be seen from the sketch plan. When it was seen that the whole area could be treated as one, the objects and pottery were grouped under ‘Trench VIII’ when from the north of the squatters’ wall, and under ‘Trench VI’ when from the south.

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[24] Bastion arrow-slits,	original length on outside face			6 ft.	10 in.
	final	,,	,,	5 ,,	8 ,,
Main wall ,,	original	,,	,,	8 ,,	8 ,,
	final	,,	,,	5 ,,	7 ,,

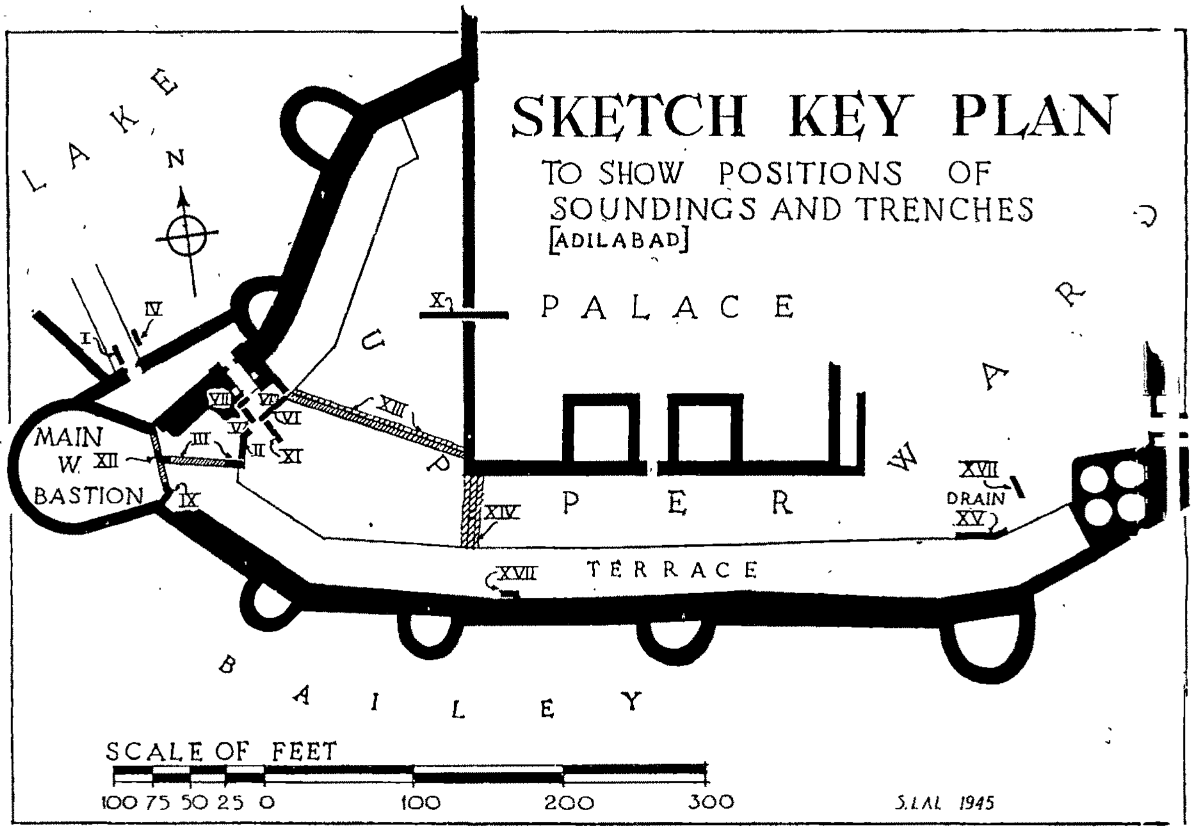

FIG. 5

Trench V, from Trench II along the N.E. face of the S.W. retaining-wall to within 4 feet of the ashlar wall.

Trench VI is the clearance of the squatters' wall from the N.E. corner of the rubble-retaining-wall about as far as Trench II. This wall is now only one course high and is not parallel to the ashlar wall.

Trench VII lies along the ashlar face of the south half of the gateway.

Trench VIII is the name for the rest of this area.

Trench IX, a pit sunk at the junction of the cross-wall cutting off the main west bastion from the upper ward and terraces, which was later carried through the floor of the *chemin-de-ronde* across to the inside of the main walls. The infilling below the *chemin-de-ronde* is of the poorest possible quality, so bad in fact that the sounding had to be filled in again at once for safety. This trench was carried down beside the wall of the terrace on *chemin-de-ronde* and in the angle the face was exposed to a depth of 11 feet below surface. The wall-face must have been built with the idea that it should be seen, as it is far too well laid to have been meant only for a foundation or to have been buried in *bajrī*.

Trench X, 4 feet wide, was cut through the doorway in the south-west side of the 'Palace' building in the middle of the upper ward. It was taken down to rock at a depth of 10 feet.

Trench XI, cut in the upper ward in line with the S.W. side of the upper gateway, 4 feet wide and [illegible] feet long, and taken down 7 feet 6 inches. Nothing of note was found.

Trench XII, sunk where Trench III meets the cross-wall at the 'neck' of the main west bastion; it revealed the blocking and straight joints of what may be another doorway through this second wall into the bastion

Trench XIII is the wall which runs from the upper gateway to near the S.W. corner of the palace. The door in this wall is 5 feet 6 inches wide and 9 feet from the west end. This wall must be late and very probably belongs to the 'squatter' period.

Trench XIV, like XIII, is really a wall and not a trench. This certainly is 'squatter' and may even be a very late wall to make a cattle or goat pen in Mughal times. This wall blocks the west end of the 'road' which runs between the palace and the south terrace.

Trench XV, to trace the south terrace wall between the east of the palace and the grain silos. Quantities of pottery (which was originally glazed) came from this trench (see p. 73).

Trench XVI is a stone-built drain about 2 feet wide by 2 feet high running north and south under the bailey east of the south gate and barbican. This seems to have been for storm-water and is entered by a shute and inlet in the roof and has been cleared of silt from the inlet to where it opens out slightly to discharge through the bailey wall by two openings which are too small to allow a man to get into the fort that way. The drain carries on north of the inlet in the direction of the upper ward, but does not line up with the similar drain of which one inlet is known in the upper ward (Trench XVIII below).

Trench XVII is a small clearance alongside the 'rafter' sockets in the lower part of the wall of the *chemin-de-ronde* on the south terrace opposite the palace. The earth here is mixed with charcoal and ash and is from 4 inches to 12 inches thick over the *bajrī* flooring of the terrace. From this earth layer came the painted and glazed pottery which can be termed 'Ādilābād type and which seems to be the typical ware of this period.

Trench XVIII is the drain in the upper ward. Only the inlet has so far been cleared and the direction noted. The outlet into the bailey is probably covered by falls from the east end of the south wall.

In several of the above trenches it will be noticed that reference had been made to *bajrī* and *bajrī* infilling. The local stone is quartzite much of which, owing to the presence of iron and salts has decayed or is still decaying to a greater or less extent. *Bajrī* is the final stage of decay when the stone has become a kind of gravelly clay in which are embedded small crystalline stones. This *bajrī* is still used in Delhi in place of gravel for paths and roads.

To the outside observer 'Ādilābād would appear to be a fortress of several storeys, certainly two floors in addition to the parapet-wall or roof over the *chemin-de-ronde*. But strangely there seems to be only one floor at any one place. This does not seem originally to have been the intention. Trenches IX and XII were taken down beside two of the inner walls of the fort, and it is obvious that the faces exposed were originally intended to show, the joints being carefully finished off and the whole face flush and even, quite different from the footings in Trench III which were obviously not intended to be seen.

Again, in Trench XVII, the openings in the side of the wall of the *chemin-de-ronde* facing the upper ward look, at first sight, as if they were ventilation-holes to some room or passage below.[25] But they prove, on closer examination, to be holes to take the ends of the rafters of a floor—and therefore of a ceiling—at the level of the present terrace. There are, however, no rooms below and the whole of the terrace as well as the area inside the main west bastion to the west of the terrace and also the inside of the 'Palace' and the courtyards or roads inside the upper gate on both sides of the wall XIII, as well as everywhere else inside the fort except the grain silos by the upper east gate, are solid packed *bajrī* and stones, which have been deliberately laid down at approximately the same time.

SQUATTERS' LEVEL

It has been stated above that the whole of 'Ādilābād is one period with only a very few years, if as much, between the building of any one part and another. There is perhaps one slight exception, that is, the 'squatters' level' in the south-east part of the upper (No. 2) gate and the walls XIII and XIV and the wall beside Trench VI, all of which must be regarded as later than the rest of the buildings. Even so this secondary occupation cannot have happened very long after the fort ceased to be used as a palace and indeed may well be a consecutive occupation as a coin found 2 inches above the floor was one of Muḥammad bin Tughlaq which had been minted about 1344; it was fairly worn and may have been in circulation for 20 or 30 years. Also the type of find from this part of the fort is much more domestic than elsewhere; e.g. some bangle fragments one of black and white glass, another of copper; 2 beads (the only ones found), and a copper finger-ring (ADL. 42) with the bezel formed of 10 small pellets welded and hammered into the ring proper which seems to have had the outer edges rolled and dressed over. There were fragments of five iron needles, one of which (ADL. 32) is complete with eye and is about the same size as a modern packing needle, its length being 5 inch by $\frac{1}{8}$ inch diameter. Six of the ten pottery or stone gamesmen also come from here, together with several iron nails, as well as a small fragment of haematite rounded and scratched on one side which seems to have been the 'flint' of a flint and steel for kindling fire.[26]

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[25] These may be what has caused Hearn, *Seven Cities of Delhi*, to show 'underground rooms' at this point in the plan opposite p. 36 (ed. 1928).

[26] As no true flint exists in India, various other stones are used with steel to strike a light. The writer has a similar piece of haematite which was in use in Tibet until 4 or 5 years ago.

THE FINDS

Pottery (Figs. 6-7, pls. XIX–XXA)

One of the objects of the excavation of this closely dated site (*c.* A.D. 1325) was to determine the pottery of the period and so to assist in the dating of other medieval sites.

The pottery falls into two main groups: (*a*) glazed, and (*b*) unglazed.

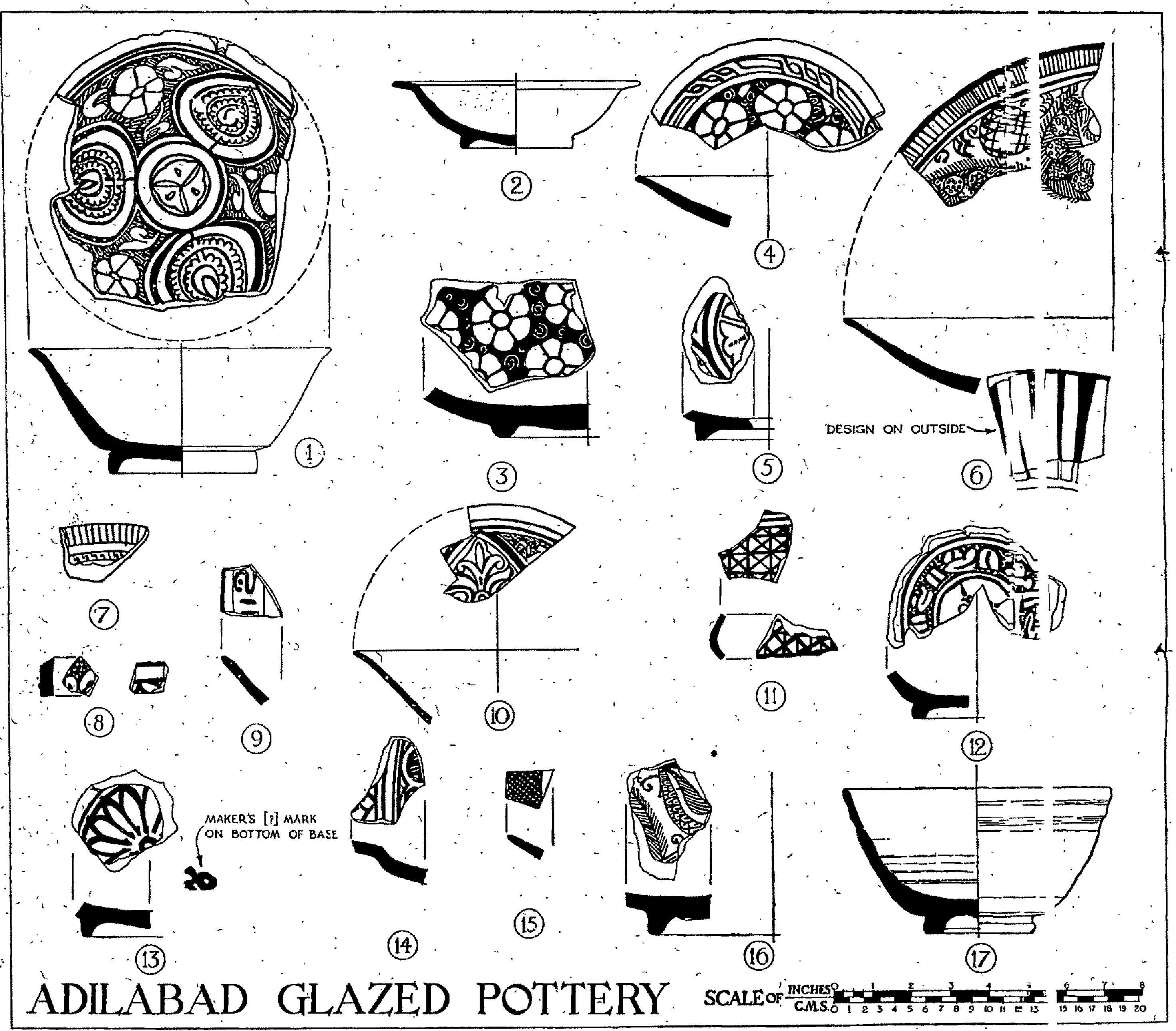

①
②
③
④
⑤
⑥
DESIGN ON OUTSIDE
⑦
⑧
⑨
⑩
⑪
⑫
⑬
MAKER'S [?] MARK ON BOTTOM OF BASE
⑭
⑮
⑯
⑰
ADILABAD GLAZED POTTERY
SCALE OF INCHES 0 1 2 3 4 5 6 7 8
CMS. 0 1 2 3 4 5 6 7 8 9 10 11 12 13 15 16 17 18 19 20

FIG. 6

(*a*) *Glazed pottery*

1. (ADL. P.G. 16) Bowl of light buff ware with small white grits, glaze destroyed, underglaze decoration painted with a brush in brown picked out with blue. From Trench XVII, immediately on *bajrī* flooring of

upper terrace behind S. *chemin-de-ronde*, in association with worn coin of 'Alāuddīn Muḥammad II (1296–1316), and doubtless contemporary with the occupation (1321–7). Fig. 6, 1; pl. XXA.

2. (ADL. P.G. 17) Bowl of greyish buff fabric with bluish green glaze and black band round edge of rim. Found with No. 1. Fig. 6, 2.

3. (ADL. P.G. 15) Coarse pinkish buff ware, glaze destroyed, underglaze pattern in black paint picked out with blue. From Trench XV, in débris fallen from terrace to the S.E. of the 'palace', probably from the same layer as Nos. 1 and 2. Fig. 6, 3; pl. XIX, 1.

4. (ADL. P.G. 18) Plate of whitish buff ware, glaze destroyed; underglaze pattern similar to No. 3 in brown-black paint picked out with blue. From same place as No. 3. Fig. 6, 4; pl. XIX, 2.

5. (ADL. P.G. 2) Base of buff ware, glaze destroyed, underglaze pattern in brown paint picked out with blue. From Trench II, in débris from terrace. Fig. 6, 5; pl. XIX, 3.

6. (ADL. P.G. 1) Dish of buff ware, glaze mostly destroyed, underglaze pattern in brown and black. From same place as No. 5. This dish is exceptional in having external decoration, consisting of a frieze of alternating thick and thin bands. Fig. 6, 6; pl. XIX, 4.

7. (ADL. P.G. 1, ii) Rim of similar vessel to No. 6, with underglaze pattern in blue paint. Fig. 6, 7; pl. XIX, 8.

8. (ADL. P.G. 6 and 8) Fragments of dish of light buff ware, glaze destroyed, with underglaze pattern in brown paint. From the make-up of the lower ramp immediately outside the lower gate of No. 2 gateway and therefore dated to *c.* 1321-2. Fig. 6, 8; pl. XIX, 7.

9. (ADL. P.G. 3) Light buff ware, slight traces of glaze, underglaze pattern in bluish and black paint. Fragmentary inscription in Arabic script. Embedded in the original mortar of the flooring of the S.W. guard-room of gateway No. 2, and therefore not later than 1321-2. Fig. 6, 9; pl. XIX, 6.

10. (ADL. P.G. 9) Buff ware, glaze mostly destroyed, underglaze pattern in brown and blue paint. From débris within 1 foot of flooring of the inner half of upper gate of gateway No. 2. The débris may be dated to within two or three decades of the building, i.e. *c.* 1321–1350. Fig. 6, 10; pl. XIX, 5.

11. (ADL. P.G. 10) Coarse buff ware, glaze destroyed, underglaze pattern in brown paint. From same place as No. 10. Fig. 6, 11; pl. XIX, 9.

12. (ADL. P.G. 11) Buff ware, glaze destroyed, underglaze pattern in brown paint. The pattern includes an imitation of Arabic script. From same place as Nos. 10 and 11. Fig. 6, 12; pl. XIX, 10.

13. (ADL. P.G. 12) Coarse buff ware, glaze destroyed, underglaze pattern in brown and pale green paint. On the underside of the base is a part of a (? potter's) mark. From same place as Nos. 10–12, but immediately on original flooring. Fig. 6, 13; pl. XIX, 11.

14. (ADL. P.G. 13) Light buff ware, glaze destroyed, underglaze pattern in brown and pale green paint. From same place and level as No. 13. Fig. 6, 14; pl. XIX, 12.

15. (ADL. P.G. 5) Buff ware, glaze destroyed, underglaze pattern in brown paint. From the layer of débris on the 'elephant steps' between the two gates of gateway No. 2. Fig. 6, 15.

16. (ADL. P.G. 4) Coarse buff ware, traces of glaze, underglaze pattern in dark blue paint. From an unstratified deposit in the upper ward. Fig. 6, 16; pl. XIX, 13.

17. (ADL. P.G. 7) Coarse reddish ware, green glaze on interior surface. Found at the base of the bailey wall outside gateway No. 2. Ancient but not closely stratified. Fig. 6, 17.

(*b*) *Unglazed pottery.* (Fig. 7)

The fabric of most of the unglazed pottery is a moderately well-levigated reddish clay. Exceptions are noted.

18. Rim found with No. 9 above. Purplish buff fabric.

19–24. Rims from the base of the débris on the 'elephant steps' of gateway No. 2. No. 23 bears a frieze of simple moulded decoration.

25–30. Rims from mortar in the débris of upper No. 2 gateway. (No. 29 darkish buff.)

31–34. Rims from Trench II, 1 foot below surface of upper ward and in association with Nos. 5 to 7. No. 33 grey fabric with black core.

35–38. Rims from immediately on floor of inner half of upper gate of gateway No. 2 in association with No. 13.

39–41. Rims from same place as Nos. 35–38 but within 1 foot of floor. Nos. 39 and 40 dark grey to black fabric. No. 41 has traces of red slip on shoulder and has been trimmed with a knife below the carination.

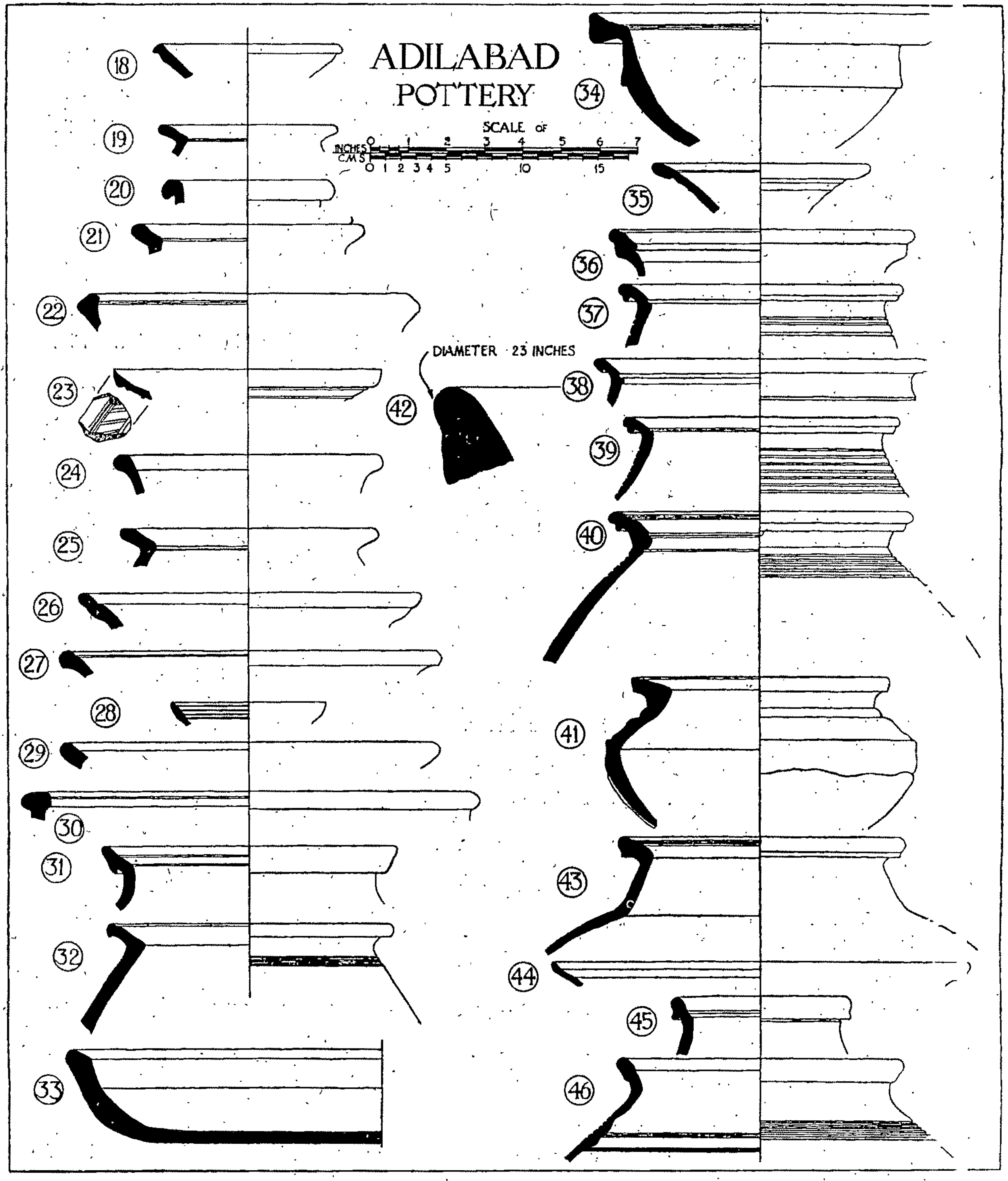
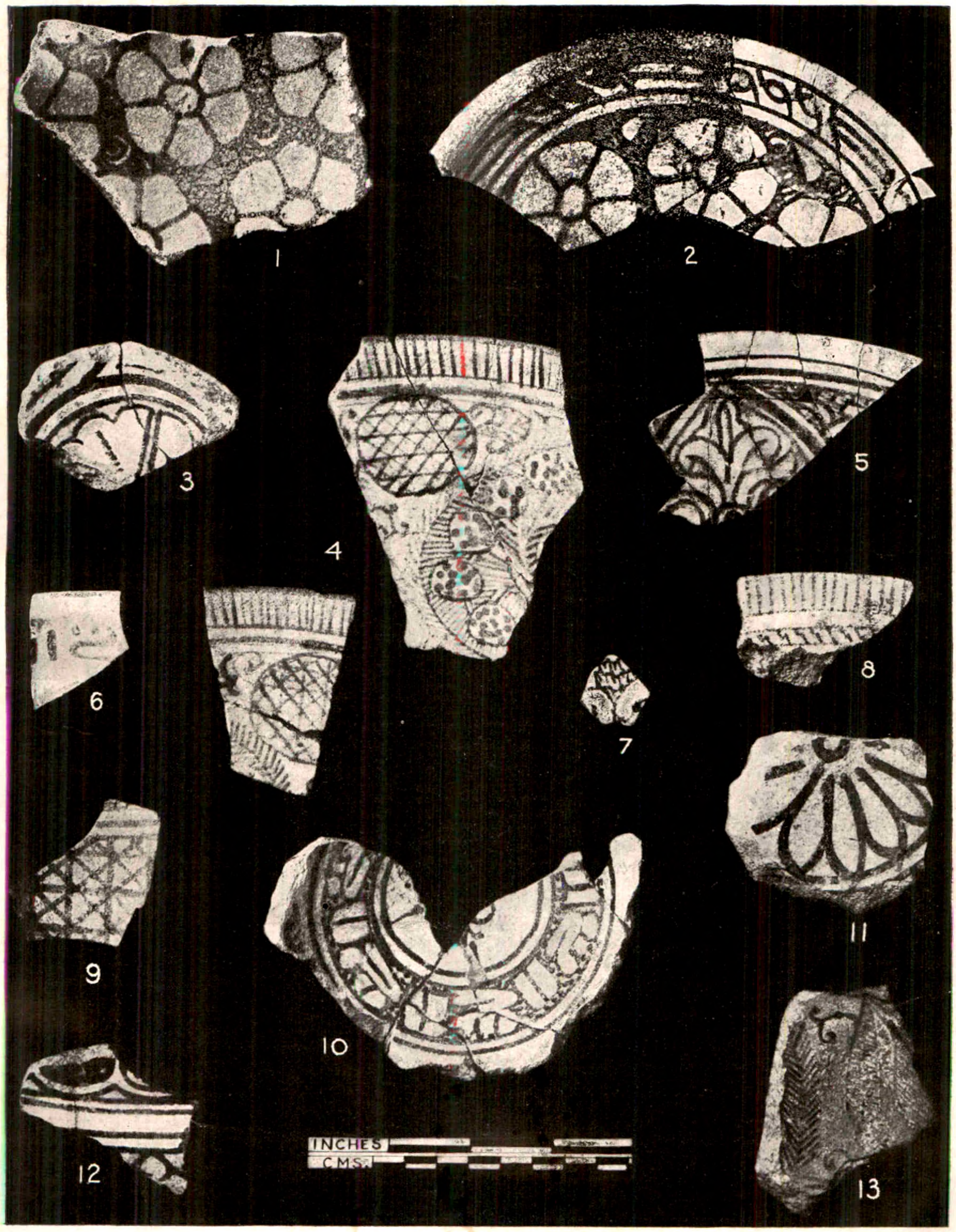


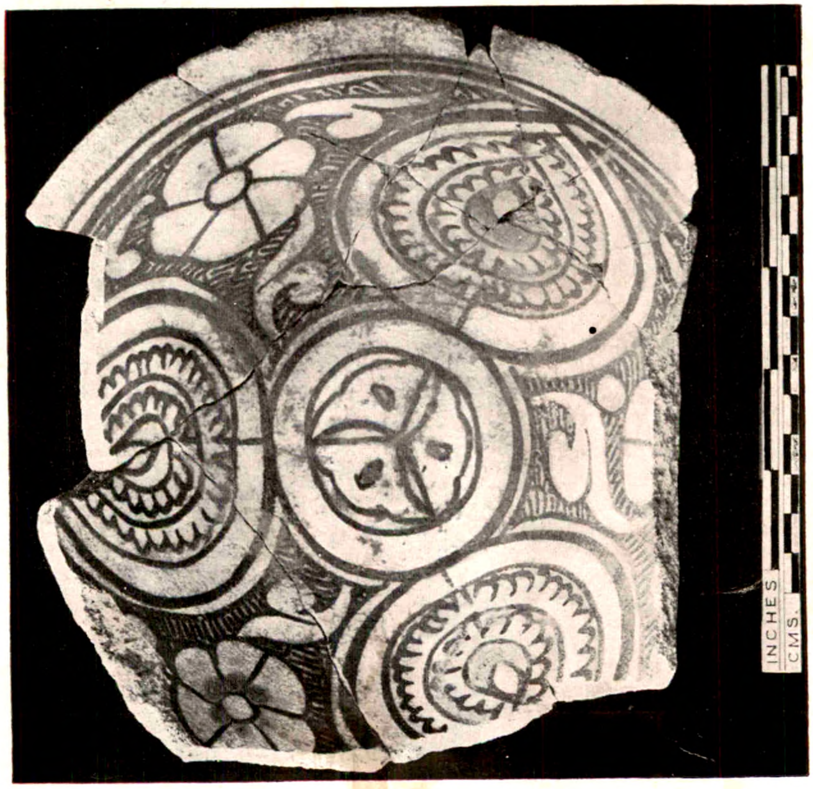
FIG. 7

42. Rim from débris in breach in curtain wall opposite upper gate of No. 2 gateway. Coarse light red fabric with black core.

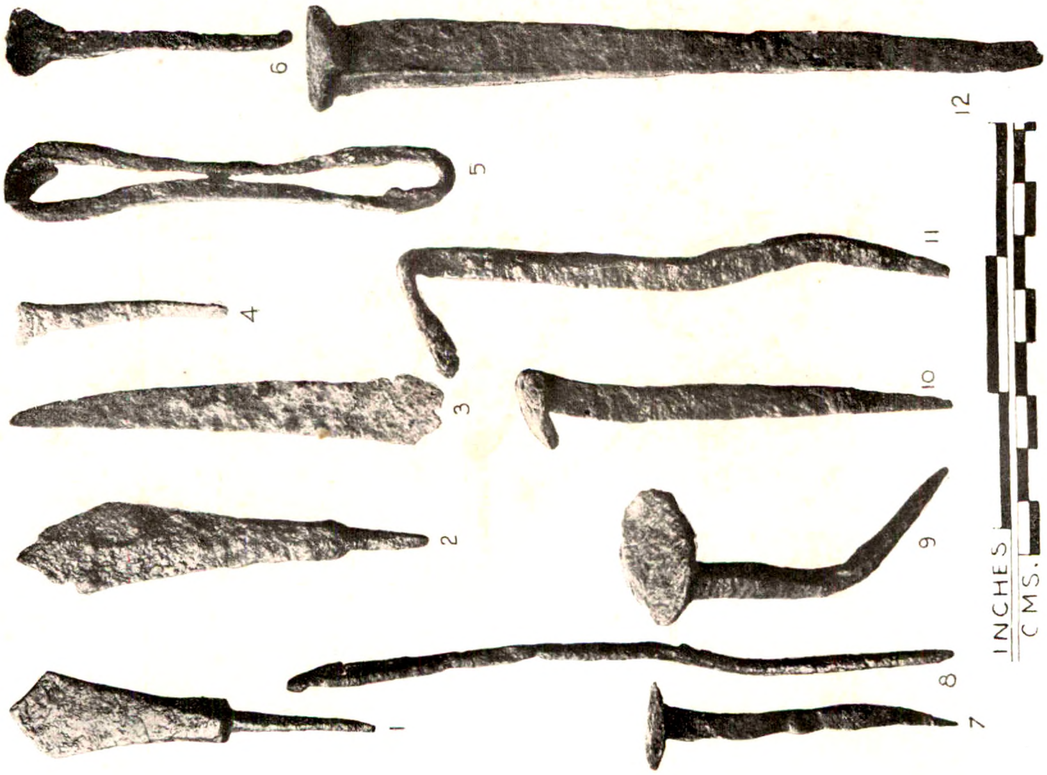
PLATE XIX



Painted and glazed pottery from ʻĀdilābād, c. A.D. 1325.



A. *Glazed dish, ADL. P.G. 16.*



B. *Objects of iron.*

43-44. Rims from débris between lower ramp outside No. 2 gate and the base of the bailey wall.

45. Rim from débris on 'elephant steps' half-way between upper and lower gates of gateway No. 2.

46. Rim from débris on 'elephant steps' just inside lower gate of gateway No. 2.

COINS

1. (ADL. 80) Copper coin of 'Alāuddīn Muḥammad II K͟haljī, A.H. 695–715 (A.D. 1296–1316). *Delhi Museum Catalogue*, p. 95, No. 362. *Indian Museum Coin Catalogue*, p. 43, No. 239.

Found in Trench XVII in close association with the lamp ADL. 81 and glazed pottery bowl No. 1 above.

2. (ADL. 28) Copper coin of Muḥammad III bin Tug͟hlaq, struck in the name of the 'Abbāsī K͟halīfa Al-Ḥākim II, who conferred upon him the title of Nāṣir Amīr-al-Muminīn in A.H. 744 (A.D. 1343-44). *Delhi Museum Catalogue*, p. 152, No. 640. *Indian Museum Coin Catalogue*, p. 59, No. 374.

Found in débris inside the upper gate of gateway No. 2, 2 inches above floor.

SELECTED IRON OBJECTS

(Pl. XXB)

1. (ADL. 17) Arrowhead with tang. Shows signs of having been much used and resharpened. From Trench II, one foot below surface of upper ward and 4 feet to S.W. of innermost corner of upper No. 2 gateway.

2. (ADL. 7) Arrowhead with tang, which may have been broken off. From 5 inches above floor of landing at bottom of 'elephant steps' of gateway No. 2.

3. (ADL. 79) Knife blade with traces of 3 rivets for attachment to handle. From Trench XVII immediately on *bajrī* flooring of upper terrace behind S. *chemin-de-ronde* in close association with glazed pottery bowl ADL. P.C. 16 and coin of 'Alāuddīn Muḥammad II (1296–1316).

4. (ADL. 4) Buckle (?) tang. From débris on 'bench' inside lower gateway No. 2.

5. (ADL. 48) Clip or link of rectangular section. From Trench VIII within 3 inches of floor of inner half of upper gateway No. 2.

6. (ADL. 50) Nail of square section with head formed by end being flattened out and then bent over. From Trench IX at W. end of upper terrace behind S. *chemin-de-ronde.*

7. (ADL. 34) Nail with roughly circular head formed by being dressed down on all sides probably on a holed anvil. From Trench V near floor of inner half of upper gateway No. 2. ('Squatters' level'.)

8. (ADL. 32) Needle of circular section, with large eye. From Trench V in association with No. 7.

9. (ADL. 33) Nail of rectangular section with roughly oval head formed by being dressed down probably, on a holed anvil. From Trench V close to No. 7.

10. (ADL. 18) Nail of thick square section with triangular head formed as No. 5. From Trench II in association with No. 1.

11. (ADL. 21) Nail of thick square section with roughly triangular head formed as No. 5. From Trench II in close association with No. 9.

12. (ADL. 47) Nail, large, of thick rectangular section with triangular head formed as No. 5. From Trench VI 6 inches below surface of upper ward just outside upper gateway No. 2.

GAMESMEN (DISCS)

1. (ADL. 56) Cut from base of a glazed pottery plate showing trace of base-ring. $1\frac{7}{8}$ in. diam., $\frac{1}{3}$ in. thick. Black paint under glaze which is now destroyed From Trench VIII within 3 inches of floor of upper gateway No. 2.

2. (ADL. 36) Cut from coarse red pottery. $\frac{1}{2}$ inch thick. From Trench V near floor of inner half of upper gateway No. 2 ('Squatters' level').

3. (ADL. 35) Cut from grey pottery. $1\frac{7}{8}$ in. diam., $\frac{2}{3}$ in. thick. From Trench V close to No. 2.

4. (ADL. 24, i and ii) Pair cut from plain glazed pottery. Glaze mostly destroyed. $\frac{5}{8}$ in. diam., $\frac{3}{16}$ in. thick. From Trench VI, one foot below surface of upper ward close to upper gateway No. 2.

5. (ADL. 44) Cut from grey pottery. 2 in. diam., $\frac{1}{2}$ in. thick. From Trench VII close to floor of inner half of upper gateway No. 2 ('Squatters' level').

6. (ADL. 64) Roughly cut from red pottery. 1½ in. diam., $\frac{3}{16}$ in. thick. From Trench VII close to floor of inner half of upper gateway No. 2 ('Squatters' level').

7. (ADL. 74) Roughly cut from red Muttra Stone, perhaps a mason's chip from Tughlaq's Tomb. ½ *inch* thick. From Trench VI close to floor of inner half of upper gateway No. 2 ('Squatters' level').

8. (ADL. 23) Cut from grey pottery. 2⅛ in. diam., ⅜ in. thick. From Trench II. In association with No. 4.

9. (ADL. 22) Roughly cut from red Muttra Stone as No. 7. 2⅛ in. diam., ¾ in. thick. From Trench II in association with No. 4.

The writer takes this opportunity of thanking all those who assisted in this excavation and for advice and suggestions in the drawing up of the report, and in particular his wife who spent long hours excavating, cleaning, sorting and joining potsherds and revising typescript.

TECHNICAL SECTION

In this section of Ancient India *it is proposed to publish from time to time notes of a technical character for the information of archaeologists in India. Future issues will include notes on archaeological photography, methods of excavation, soil-analysis, and other matters relating to archaeological technique. The present note is contributed by the retired Archaeological Chemist to the Archaeological Survey, whose experience of chemical conservation in India is unique.*

NOTES ON THE PRESERVATION OF ANTIQUITIES IN THE FIELD

By KHAN BAHADUR MOHD. SANA ULLAH

PART I—TREATMENT

1. Many antiquities discovered during excavations are found to have undergone alteration or deterioration as a result of the chemical and physical changes which have taken place in them during the long period of their burial in the soil. Frequently, their original form and details are obscured or obliterated, and the fabric itself is considerably weakened. The nature and extent of these transformations depend on the composition of the material, character of the soil, and age of the site. Even after exhumation there is risk of further deterioration under atmospheric influence. Some objects begin to disintegrate soon after exposure to the air, others may remain apparently unaffected for weeks or longer; but once the signs of deterioration manifest themselves, further destructive changes proceed apace. It is, therefore, very important to undertake suitable preservative measures without any unnecessary delay. Moreover, before an object can be studied properly, its original form and details must be restored as far as possible. For both these purposes various chemical and mechanical treatments are necessary.

2. The methods used for the restoration and preservation of antiquities of various kinds differ according to the nature of the material and the state of preservation of the objects. In the simplest cases mere washing with plain water is all that is necessary, but oftener complicated chemical or electro-chemical treatment, besides skilful manipulation and repair, is called for. In the field, only the simpler processes should be attempted. All problems requiring sound chemical knowledge or objects demanding expert treatment should be referred to the Archaeological Chemist of the Archaeological Survey of India.

3. For the purpose of preservative treatment, antiquities can conveniently be grouped as follows:—

A. *Siliceous and calcarious materials* :—terracotta or pottery, stone, faïence, stucco, gypsum, glass, enamel and minerals.

B. *Metals*:—iron, copper and its alloys, lead, silver and gold.

C. *Organic materials* :—wood, paper, birch-bark, linen, silk, horn, leather, bone and ivory.

A. POTTERY, STONE, FAÏENCE, ETC.

4. Of all the antiquities found during excavations in India, objects of terracotta or pottery are the most abundant and well preserved; but being porous they are impregnated with salts derived from the soil. Variations in temperature and the humidity of the atmosphere cause these salts (chlorides, sulphates and sometimes nitrates, alkalies, lime and magnesia) to crystallize out or to go into solution again within the pores. The repetition of these processes causes the disintegration of the objects. It is therefore important that the objects should be freed from the injurious salts immediately after their examination, by repeated steeping in plain water. This simple treatment is applicable to all the objects belonging to group A above.

5. Before an object is steeped in water, it should be carefully ascertained that this treatment will not harm it in any way. The best plan is to place a few drops of water on the object and see if they produce any harmful effects. All objects which are likely to be injured by contact with water should be sent to the Archaeological Chemist for necessary treatment.

6. The *steeping process* is as follows:—

Very small antiquities are washed by suspension in deep glass or porcelain vessels containing water. Ordinarily the steeping is carried out in galvanized iron tubs or tanks of suitable sizes and provided with a wooden grating which rests firmly half-way down the sides of the vessels. The objects (which have already been marked with Brunswick black paint) are placed on the wooden grating and the vessel is flushed with water, covering the objects entirely. A careful record of the contents of each tub is kept in a note-book. The water used should be free from saline impurities. It is not generally possible on sites like Mohenjo-daro and Harappa, where the soil is heavily charged with salts, to get sufficiently pure water for this purpose. Therefore, arrangements should be made at the outset to get all available supplies of water chemically tested for their purity by the Archaeological Chemist, and the purest one should be utilized for this purpose.

After the objects have soaked for a day or so, they are taken out, one by one, freed from mud and incrustations with the aid of a knife or brush, and immersed again in a fresh supply of water. Hard calcareous incrustations can be removed by immersion in or application of 3 per cent. muriatic acid. Gypsum crystals generally fall off, or can be chipped off, in the course of the steeping, but difficult cases will require burning treatment in a muffle-furnace. Whether these side-treatments are necessary or not, the steeping-water is changed daily in the first week, twice in the second, and weekly subsequently.

The progress of the washing operation is judged by testing the wash-water chemically for its salinity. It is generally sufficient to test for the chlorides only by silver nitrate solution,[1] as these are invariably present with other salts in the soil. The silver nitrate test is carried out thus:—

Two clean test-tubes of the same size are half-filled, one with pure water from the supply and the other with the wash-water. To each of these tubes are added ten drops of silver nitrate solution and the tubes are shaken. A white precipitate or milkiness is produced which varies with the amount of the chlorides present in the water. The milkiness produced in the supply-water should be slight. In the first week the difference in the milkiness is very marked, but it becomes less subsequently, indicating the gradual elimination of the injurious salt. The washing is continued until the milkiness produced in both the waters is the same. This signifies that the objects have been washed free from the salts. If the objects were charged heavily with sulphates, the washings in the final stages should also be tested with barium chloride solution.[2] A white precipitate indicates the presence of sulphates. For objects of special value, a final washing should be done with distilled water.

When the objects have been freed from the salts, they are dried. Large objects are dried by exposure in the air but small ones should be dried in a hot-air oven, at 80°–100°C., for a few hours. Subsequently they are repaired or impregnated, as necessary.

Special cases.—Ordinary pottery and terracotta stand the washing treatment well, but special precautions have to be taken if these objects are covered with painted designs or colours. In such cases the surface should be freed carefully of all adhering mud, etc., by brushing, and the painted designs coated with 5 per cent. vinyl acetate solution in order to fix the colours before placing the objects in water.

7. Unbaked clay obviously cannot withstand the action of water. It should be allowed to dry in the shade and be impregnated with 10 per cent. vinyl acetate solution or hard paraffin wax which is melted and applied hot by means of a brush. If the object is charged with salts then the best plan is to keep it in a desiccator jar; or it should be baked and thus rendered fit for steeping in water to eliminate the salts.

8. It should be noted that limestone, marble and certain other varieties of stone are affected by acids. Gypsum and alabaster are slightly soluble in water, but this drawback can be remedied by the use of water saturated with calcium sulphate for the steeping operation. This can be prepared readily by shaking plaster of Paris in a tub of water, allowing the surplus plaster to settle down and using the supernatant water.

9. Heavy stone sculptures require several months or even longer for the complete elimination of salts by steeping. Therefore, it is more convenient to treat them by the *paper-pulp method* which is carried out as follows:—

Sheets of paper-pulp are torn up into small pieces and soaked in a tub of hot water for 24 hours. The mass is stirred well by means of wooden sticks until it is thoroughly disintegrated and assumes the consistency of thin porridge. Handfuls of the pulp are taken out and applied to the salt-affected surface until a coating ½ inch thick is built up all over it. The pulp is allowed to dry completely in the shade, when it is removed and a fresh coating is applied again to the surface. This process is repeated until a specimen of the dried pulp is found free from salts. This is ascertained by shaking the specimen with distilled water in a flask and testing the clear extract by the silver nitrate test.

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[1] The silver nitrate solution is prepared by dissolving 5 gms. of silver nitrate crystals in 500 c.c. of distilled water followed by 10 c.c. of strong nitric acid. This should be kept in a brown stoppered bottle.

[2] Barium chloride 25 gms., distilled water 500 c.c., hydrochloric acid 20 c.c.

10. *Repairs and impregnation after treatment.*—The materials generally employed in our laboratories now for the repairs and impregnation of pottery and terracotta are shellac and vinyl acetate resin. The shellac should be of the best orange flake quality and is dissolved in rectified spirit to form a thick solution. The shellac solution should be applied to both the edges by means of a small pointed round brush, and the excess squeezed out by pressing the parts together. The joint should be cleaned up immediately and the object left to dry in a suitable position so that the parts do not tend to fall apart in the meanwhile. A wide basinful of sand is handy for this purpose. Coarse pottery with worn edges can be repaired better by the use of solid shellac. The edges should be rendered sufficiently hot (by passing over a spirit flame) before the application of shellac. For the restoration of large vessels much experience and skill are necessary.

Vinyl acetate resin should be dissolved in a mixture of alcohol (rectified spirit) and toluene (50 : 50). 20 per cent. strength serves as a cement, but 5 and 10 per cent. solutions are required for the impregnation of decayed objects.

Repairing stone objects.—Small stone objects can be repaired by the use of shellac or vinyl acetate cements. Heavy objects of stone can be joined best by Sorel cement, which consists of (*a*) calcined magnesia and (*b*) concentrated solution of magnesium chloride, sp. gr. 1·2. These ingredients, (*a*) and (*b*), are mixed, when required, together with 2 to 4 times powdered stone and applied to the broken faces. The object is then held together firmly for two or three days to allow the cement to set hard.

B. METALS

11. The treatment of metallic objects is a complicated problem requiring both chemical knowledge and considerable practical experience. A few of the simpler and safer methods are, however, given here and may prove handy to the excavator.

12. *Copper and its alloys.*—An efficient and safe formula for the cleaning of copper and its alloys is the following:—

Tartaric acid	1 part.
Caustic soda	1 part.
Water	10 parts.

The objects should be kept in this mixture until all the green incrustations have been dissolved away, leaving the liver-red core behind. They should then be washed thoroughly in several changes of water, until free from chlorides (as found by the silver nitrate test), and finally coated with 10 per cent. vinyl acetate solution. Completely oxidized coins should, at the outset, be left in 10 per cent. sodium metaphosphate solution until free from calcareous matter. Sometimes this is sufficient to reveal the inscription. Otherwise, treat with the abovementioned tartrate mixture diluted to half the strength. Finally wash well, dry and coat with 10 per cent. vinyl acetate solution.

13. *Silver.*—Coins and objects of silver debased with copper can be cleaned by 3 per cent. sulphuric acid until free from all red spots of copper oxide. Finally the coins are brushed and washed well in water. Silver objects and coins of the purer metal which are oxidized superficially can be cleaned by immersion in dilute ammonia or dilute formic acid. Or, they should be wrapped up in zinc sheet and suspended in water acidified with a few drops of acetic acid for a couple of hours.

14. *Iron.*—Objects of iron which retain most of the metal in the unaltered condition (as revealed by filing or being strongly attracted by a magnet) can be cleaned by electrolytic reduction. This can be carried out readily by wrapping the objects with strips of zinc sheet and immersing in 5 per cent. caustic soda solution contained in a glass vessel. After about six hours they are freed from the zinc and placed in 2 per cent. dilute sulphuric acid for a few minutes to dissolve the adhering zinc oxides. Wash well until free from chlorides [1] and dry in an oven at 80°C. Finally they should be coated with bakelite varnish or 10 per cent. vinyl acetate.

Iron objects in an advanced state of oxidation cannot withstand the electrolytic reduction. They should be kept in 5 per cent. caustic soda solution for about a week in order to decompose the injurious chlorides, followed by thorough washing with plain water until the washings are free from chlorine.[1] All the superfluous incrustations or oxides should be ground off carefully by the aid of carborundum files and blocks; but the surface will have to be finished properly in the laboratory, where an electrically-powered lathe fitted with a flexible shafting and small grinding wheels should be available.

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[1] As proved by the silver nitrate test.

15. *Lead.*—Objects of superficially oxidized lead can also be cleaned by the electrolytic reduction method mentioned above; but the washing should be done with freshly boiled water, and vinyl acetate or wax should be employed for coating them. Lead should be stored in air-tight metal containers or stoppered bottles.

16. *Gold and electrum.*—Washing with plain water is generally sufficient for these objects, but any obstinate stains or incrustations can be freed by immersion in strong hydrochloric acid.

Important note.—It is necessary to point out that the treatment of metallic antiquities should be undertaken without delay and the Archaeological Chemist should be asked to re-examine the articles which have been treated at the site, so that he may be in a position to carry out any further scientific treatment that is called for. In saline areas the copper and iron are invariably charged with unstable chlorides which can be eliminated only by careful chemical treatment. Cases have been observed where such objects have remained unaffected for several years but suddenly serious disintegration has set in due to atmospheric action. When it is necessary to store away such antiquities for some considerable time, the safest plan is to keep them in air-tight metal containers with the lids sealed up with wax and along with some fresh quicklime to keep the contents quite dry. These changes cannot start in the absence of moisture. Completely oxidized metallic objects should be passed on to the Archaeological Chemist for necessary treatment.

C. Organic Materials

17. *Bone and ivory.*—Objects of bone and ivory are generally found in a very fragile condition and disintegrate rapidly on drying. In a saline area these objects may be reduced to powder in a day or two after their excavation. It is, therefore, necessary to strengthen them *in situ* and carry out their treatment immediately. Better-preserved objects should be secured at the outset by winding a thin cotton string repeatedly all round them (to prevent splitting or any loose fragments from falling off) and immersed in water to wash out the salts completely. Then dry in the hot-air oven and impregnate with 10 per cent. vinyl acetate solution. The objects are wiped clean and allowed to dry overnight. The cotton-string windings and excess of the preservative are now removed by carefully moistening with a little toluene, and the surface freed of any adhering incrustations by scraping with a knife or file.

18. The proper handling of *skeletal remains* requires some experience and careful manipulation. In the case of burials all the bones have to be exposed completely along with the associated pottery, etc.,[1] and kept undisturbed until photographs or diagrams have been prepared. Therefore the bones will have to be strengthened *in situ* immediately after their exposure, by the application of 10 per cent. vinyl acetate or thin shellac solution. When the soil is excessively saline, the bones should be treated with paper-pulp (to remove the salts) before impregnation with these preservatives. When the necessary records and photographs have been taken, the bones will have to be strengthened further by pasting strips of paper or linen over them; otherwise, they are liable to break up when lifted from the ground. The other side of the objects should be treated similarly after their removal.

Thin bone or ivory specimens will need a sufficiently strong support to prevent damage. Therefore further reinforcement may have to be provided by means of plaster of Paris, with wooden bars embedded in it.

19. *Textiles, paper, etc.*—Textiles and paper should be freed from injurious salts by pressing between wet sheets of blotting paper several times; while adhering mud, etc., is removed simultaneously by means of a soft round brush.

20. *Old birch bark* can be rendered pliable by steaming and this can be done by suspending it (by means of a wire gauze stirrup) in a tall vessel in which water is kept boiling. After two minutes the specimen is taken out and immediately pressed flat between two sheets of blotting paper. When dry, impregnate with 10 per cent. vinyl acetate solution.

21. Objects of *wood* are generally found in a highly decayed and fragile condition. The utmost care is necessary in drying damp wood freshly dug from the soil as it is liable to split, warp, or be destroyed altogether on exposure to the air. It is, therefore, advisable to embed the specimens in a thick layer of wet sawdust or moss

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[1] To preserve the pottery against disintegration due to the presence of salts, it should be coated freely with glycerine and water (1 : 1 mixture).

d send on to the Archaeological Chemist immediately for suitable treatment. Wood from saline areas must washed or treated with paper-pulp immediately for the elimination of the salt. Dry wood should be pregnated with 10 per cent. vinyl acetate or hard paraffin wax.

22. *Fumigation.*—All objects of organic origin must be fumigated with thymol or carbon disulphide to stroy bacteria or insects that might be present in them. They should be stored in air-tight containers with me para-dichlorbenzol crystals.

PART II—EQUIPMENT

List of chemicals, etc., required for an archaeological field laboratory at a major excavation

raffin wax, 60°C.	10 lbs.
% Vinyl acetate solution in alcohol plus toluene (50 : 50)	2 gals.
% do. do.	2 gals.
% Vinyl acetate solutions in toluene	500 c.c.
lcohol (rectified spirit)	1 gal.
luene	1 gal.
ellac, orange flake	2 lbs.
% Silver nitrate solution plus 5% nitric acid	500 c.c.
ustic Soda (flake)	7 lbs.
nc sheet (very thin)	2 lbs.
nc granulated	2 lbs.
icklime (in air-tight container)	4 lbs.
dium metaphosphate	2 lbs.
ra-dichlorbenzol	1 lb.
per pulp	20 seers
read, cotton reel	6
tton wool rolls	6
onges	2
icers	2
edles, 3″	4
nknives	4
issors, 8″	1
les, assorted	3
ster of Paris	10 lbs.
uslin	10 yds.
nny cloth	20 yds.
nny string	2 lbs.
rborundum file and blocks rectangular (fine and medium)	4
l stove (Primus)	1
irit lamp (brass)	1
irit stove	1
atrice oil stove	1
ucepan with handle, iron, dia. 7″	1
n stand tripod, round top, ht. 8″, dia. 6″	2
tomatic water still (for distillation of water)	1
ushes, nail, hair	12
ushes, fibre	12
ushes, flat, paint, ½″, 1″	6 each
ushes, round, paint, dia. ½″ and ¾″	6 each
ushes, round, paint, small	3
t-air oven, copper, 10″×12″×10″, with one wire gauze shelf	1
ance, weighing, sensitive to second decimal place	1
ights in box: 50 gms. to ·01	1 set

Evaporating basins, porcelain, dia. 3″, 4″ and 5″	3 each
Test-tubes, glass, 6″ × $\frac{3}{4}$″	2
Test-tube stand (wooden) for 12 tubes	2
Glass pipette, 25 c.c.	2
Glass cylindrical jars stout with ground top, ht. 8″, dia. 3″	3
Glass cylindrical jars stout with ground top, ht. 12″, dia. 4″	4
Glass cylindrical jars stout with ground top, ht. 15″, dia. 4″	2
Glass test-tubes with hole $\frac{1}{8}$″ at bottom and wire hook at top for suspension, dia. 1$\frac{1}{2}$″, 1·10″	[illegible]
Measuring cylinders, graduated, 500 c.c.	[illegible]
Measuring cylinders, graduated, 10 c.c.	[illegible]
Rectangular glass jars (battery)	[illegible]
Bottles, wide-mouthed 16 oz. (with cork)	[illegible]
Bottles, narrow-mouthed, with glass stopper, 1000 c.c.	[illegible]
Bottles, narrow-mouthed, with glass stopper, 600 c.c.	[illegible]
Cups, China, dia. 3″	[illegible]
Cups, China, dia. 5″	[illegible]
Cups, China, dia. 8″	[illegible]
Spatula, iron 9″	[illegible]
Spoon, iron, 6″	1
Tub galv. iron, deep pattern, with wooden trellis partition to fit half-way down	[illegible] sets

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